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QUANTITIES.

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QUANTITIES:
A TEXT-BOOK FOR SURVEYORS.
IN TABULATED FORM,

EXPLANATORY OF THE BEST METHODS ADOPTED IN THE
MEASUREMENT OF BUILDERS' WORK, AND CONTAINING MANY
USEFUL HINTS AND MUCH VALUABLE INFORMATION
FOR THE SURVEYOR.

COPIOUSLY ILLUSTRATED.

AND CONTAINING ALSO

TABLES OF THE VARIOUS TRADES,

AND FOR THE MEASUREMENT AND VALUATION OF DIFFERENT
MATERIALS IN NEW WORK AND REPAIRS.

WITH

TABLES OF CONSTANTS,

FOR THE VALUATION OF LABOUR;

COMPARATIVE TABLES OF DIFFERENT COUNTRIES, &c.

And a complete Index for ready reference.

BY BANISTER FLETCHER, F.R.I.B.A.

*(Author of 'Model Houses,' 'Dilapidations,' 'Compensations,' 'Arbitrations,'
'Light and Air,' 'The Metropolitan Building Acts,' etc.).*

WITH CHAPTERS ON
CUBING; FORMS OF FAIR BILLS; PRICED SCHEDULES; THE LAW; AND
EXAMPLES OF "TAKING OFF."

Illustrated by Plates and Woodcuts.

FIFTH EDITION REVISED.

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PREFACE TO FIFTH EDITION.

THAT a fifth Edition should be required at all would be a matter of much congratulation; but that it should be so soon called for must be indeed intensely satisfactory and should urge the author to work harder than ever to retain and increase his reputation.

The success of the book no doubt proves conclusively that the claim made in the preface to the second edition, in the following words—

> It is almost unnecessary to repeat what I claim for this book (and its three sisters)—that it is a complete treatise or text-book on the subject: for, while it is the "vade-mecum" of the student, it is the "work ot reference" of the practitioner—

is fully admitted. I have spent much time in revising this edition and in endeavouring to make it as perfect as such a work can be, and I believe it now contains everything necessary for the work of the Quantity Surveyor.

It is, no doubt, often the case that the use of the book is not fully appreciated, because the student does not realise how to quickly find what he wants. I would therefore beg him to carefully study the Table of Contents (pages vii. to xiv.), where he will find the contents of the chapters fully epitomised; then pages xv. and xvi. will at once tell him of everything *illustrated* in the book; and I think if he turns to the *Index* at the end of the book, he will readily find anything he may want to refer to. The Index includes a list of the Tables, giving the order of measurement of the various items in each trade and their position in the Fair Bill, a chapter on Repairs, and a list of abbreviations which will save much labour; further, there is a very comprehensive chapter upon "The Law," also an example of the "taking-off" of an entire front of a house, and of all the trades for one room, illustrated by plans, elevations, and sections, enabling the student to fully master the subject. He will also find chapters on Cubing, Forms of Fair Bills, and Tables of Constants, enabling him to price out work according to the varying rates of wages.

In the present edition, besides correcting any errors that had hitherto escaped notice, I have carefully revised and extended the chapter upon "The Law," bringing it down to this date, and have made several additions to the Tables which form the Appendix. I have also devoted much pains to increasing the completeness of the Index.

BANISTER FLETCHER.

29, New Bridge Street,
Ludgate Circus, E.C.,
January, 1888.

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QUANTITIES.

CHAPTER I.

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I TRUST no apology is necessary for introducing to the professional world the subject of builders' quantities. That it has already been treated of I readily admit, and by many authors, and indeed what subject has not? but from some cause or other, the works published on it have failed to attain to that standard of excellence which is necessary to entitle them to be considered "*Works of Reference.*" I am the more convinced of this from the numerous letters I received from all parts of the country, during the period the series of articles which form a portion of the present work were appearing in the 'Building News'; and from the treatment it received at the hands of its numerous readers and correspondents; clearly proving to my mind, that the works already published must, from some cause or other, have failed to impart that knowledge to the uninitiated for whose benefit they were doubtless written, or perhaps their authors had failed to make that advancement in the subjects they treated of, which is so essential in this age of progress.

Tempora mutantur, et nos mutamus in illis. This motto may also be applied to the several vocations in life. Look at whatever profession you may, and you will find that the system of progress has made repeated changes; take the legal profession; new Acts of Parliament supply the place of old, or the medical profession, where late scientific discoveries have tended to revolutionize the old sysem. And is it not so with our own profession, where the slow laborious methods followed by the old class of surveyors have been superseded by the more advanced and scientific methods adopted by their younger brethren of the present time? It is, therefore, necessary to any individual who wishes to attain to eminence in any profession to work continuously and hard, and more than moderate attention is required to ensure even a *modicum* of success.

It is not intended in the present work to enter into the subject of design or taste, or even to mention them, as the desire of the author is to exclusively confine himself to the subject of quantities and their valuation, and he hopes that his endeavours in this respect will meet with the success he desires, and that this handbook may be considered the surveyors' *vade mecum*. Should failure await these intentions, at least instruction will be given in a condensed form in the same manner (as far as the subject permits) as in his works on 'Dilapidations,' 'Compensations,' and 'Arbitrations,' useful alike in teaching the young practitioner and, it is hoped, as a reference to the more mature.

In the following chapters, whilst entering as fully into the subjects as they may demand, I have condensed them as much as possible, so as to do away with any unnecessary reading, which, whilst tiring to the student, imparts but little or no information. I have, to save time as much as possible, given a most complete index, which, I believe, will be found of great service in enabling readers to find, with a single reference, whatever they may require.

The various items are scheduled under their several trades, and in showing how the works are measured I may observe that I have based my operations upon my own practical experience, and upon conclusions drawn from the works of the ablest writers on the subject. The rules laid down will be found to be those adopted by the generality of metropolitan surveyors, as their experience must necessarily be larger than that of our country brethren, and more diversified and particularized. With this object in view, I hope to fully elucidate the subject, so that an uniformity of measurement may be adopted throughout the kingdom. At present many differences exist amongst quantity surveyors in their methods of measurement of the various classes of work. Some of these differences arise from the fact of surveyors adopting their own peculiar methods, and some again from a lack of experience and an imperfect knowledge of the science. It must also be borne in mind that the admeasurement of artificers' work is not confined to the profession of quantity surveyor. Many builders in tendering for works where the quantities are not supplied, take off their own rather than incur an expense, by employing a surveyor, in the event of their tender not being accepted. Builders do not, as a rule, enter so minutely into the subject as surveyors, they measure the work more fully, which allows for omissions. I regret that this is a plan adopted by many so-called surveyors who, from a lack of knowledge or some other cause, measure their work *full* to give a margin of allowances for omissions in the description of labour, which they intentionally omit or are unable to measure (and this is particularly noticeable in masons' work, where I have seen the cube stone described, including all labour, in the one item); or again, but in rarer cases, where all is properly described with respect to items, certain additions are made to provide against any discrepancy (if any) which may have occurred in the hurry of taking off. It is a well-known fact that many builders (so-called practical men) do not know the actual technical terms used to express certain classes of work, and consequently some of their prices are somewhat erratic. This accounts to a slight degree for the variations in tendering we so often meet with. And as a proof that surveyors themselves are not strictly accurate, or that their methods differ somehow from each other (to put the matter more pleasantly), it is found that the builders who know them well, in tendering from their quantities for works, can generally withstand any outsider who may be unacquainted with them. This to a certain extent arises from their having the advantage of knowing, from experience, the allowance which they may make for excess of quantities. I remember an instance of a warehouse being built in the City: the house was built one foot longer than shown upon the drawings from which the quantities were taken. The builders, a well-known firm, naturally claimed for the additional length, but strange to say forewent their claim when the architect declined to pay the extra alone, but offered to measure up the *entire* building and pay them for any excess over the quantities owing to the additional length, and also pay the commission for measuring up provided only they allowed him for any excess, should there be any, in the existing quantities on the work actually executed, clearly proving that they must have been measured *too* full from the drawings, and that the builders had already ascertained these facts. In some cases the writer has known builders to price the quantities, and then deduct a certain percentage, taking it for granted that the quantities are full.

In considering the subject of quantities, let us briefly ascertain the essential points to be noted by the student as qualifications which he must possess before he is properly qualified to carry out the instructions contained in the following chapters. *They may be summarized* as follows:—

Firstly. A thorough knowledge of the art of building.

Secondly. An acquaintance with the ordinary rules of mensuration.

Thirdly. A certain amount of tact and patience to grasp the subject so as to be able to apply the admeasurement to any description of works.

Fourthly. Accuraçy and energy.

With respect to the first of these items, it is absolutely necessary that the student should be thoroughly acquainted with the building trades, and that such acquaintance to be of effect should be practical and not simply theoretical. Unless this is the case, he will find himself beset with difficulties, which, if not insurmountable, will greatly retard the successful accomplishment of his task. This will more clearly be presented to his mind when measuring from working drawings, where much more care and knowledge are required than where measuring from the building. The other qualifications are just as essential to enable the student to become a quantity surveyor as that of which I have just spoken; the second is what most youths of an ordinary amount of intelligence possess; but the last two items are worthy of especial attention by all those who wish to attain to the goal of success.

In measuring from the building the mode of procedure is the same as where measuring from the drawings, the only difference being, as I have just said, that the latter requires a little more care.

The operations necessary to produce the schedule, or bills of quantities, from which builders make up their tenders, are: *taking off*, by which we mean the measurement or taking off of the several items and dimensions from the drawings; *abstracting*, that is, arranging or apportioning the several works from the dimensions, so as to arrive at the totals of each; and *billing*, that is, bringing the quantities with their descriptions from the abstract and arranging them in the form of a bill, and it is only the bills that are supplied to the various builders to enable them to prepare their estimates. Another operation is necessary where the work has not been carried out in its entirety *according to the* drawings and specifications from which the bills of quantities were prepared, viz. *measuring up*, by which is meant taking the dimensions from the building, and *extras* are treated in this way. *Omissions* are works which, whilst included in the bills of quantities, have not been executed, and consequently have to be deducted.

The dimensions are generally taken off and entered in a measuring book, or on paper ruled for the purpose; see specimen on next page.

The dimensions when taken are placed in the column which I mark for reference, D, the adjoining column to the right, A, being for the cubical contents, superficial area, or as the case may be, of the dimensions. To the left of the dimension column, D, is placed the number of times any particular item may occur (when more than once). Where there are several dimensions of the same character, as, for example, walls of the same height and thickness, it is undesirable to make a separate entry for each, and they are *collected* at the right-hand side of the book, a column being sometimes, though seldom (it being unnecessary), ruled for this purpose, and technically known as *waste* (see item No. 2, how obtained). The several dimensions are then cast up, and the sum, or total, placed as shown in the column D, as a collection of works of the same height and description. In the illustration given we have a rectangular building, 30 feet × 20 feet outside dimensions of walls, with all walls of the same height and thickness; they are therefore added together, and the one dimension of the total length saves the trouble of making two entries of the same kind.* It is always advisable to *collect* the work as much as possible, as it materially shortens the labour; but care must be taken to state, in addition to the description of the work, the particular situation of it, as by this means the surveyor can the more readily find a dimension at any future time, should it be required.

In taking off, always make an uniform starting point, and adopt a general course throughout. By this means it will be much easier to find any required dimension hereafter. It is

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* In Chapter II. I explain the method of obtaining the dimensions in the example here given.

Specimen.

	D	A	
	32·2 22·2 1·6	1070·0	Dig wheel and deposit to surface 20·0 (width of building) 2/1·2 = 2·4 (thickness of outside walls) 17·8 (net length of end walls) 30·0 front wall (gross) 17·8 end wall (net) 2/ 47·8 95·4 total length of four walls
	95·4 4·0 2·6	953·4	Ditto to trenches part return wheel fill in and ram (walls collected)
	95·4 4·0 1·6	572·0	Concrete as described
	95·4 9	71·6	2½ B. footings
	95·4 12·0	1144·0	1½ B. wall to top of plate (ground floor)
	95·4 18·0	1716·0	1 B. add to roof plate
	3 6 7·0	24·6	1 B. ddt. entrance door
	4·3 7·3	31·0	½ " "
3	3·0 6·0	54·0	½ B. ddt. windows (ground floor)
3	3·9 6·3	70·4	1 " " "
2/3	2·6 5·6	82·6	½ " " (1st and 2nd floor)
2/3	3·3 5 9	112·2	½ " " " "

customary to commence at the left-hand corner of the building, and from thence work round to the right hand. Also adopt one method of taking the dimensions, thus: In internal dimensions in every trade, take floor by floor, commencing at the left as before. Take the length first; secondly, the breadth or width; and lastly, the depth or height.

In the following chapters it is intended firstly, to show how the several works are measured, and at the conclusion of each trade to give the order of abstracting and bring the quantities into bill. Many surveyors have their own method of abstracting, but I think it preferable to have only one general plan throughout the profession.

CHAPTER II.

EXCAVATOR.

EXCAVATION FOR BASEMENT—OVER 6 FEET DEEP—WHEELING OVER 20 YARDS—NATURE OF SOIL—TRENCHES—ALLOWANCE IN—EXAMPLE—STRUTTING—PILING—DRIVING—IRONWORK TO—PUDDLING—DRAINS—WELLS AND CESSPOOLS—STEINING TO—PUMPS TO—CURBS TO—CONCRETE—LESS THAN 12 INCHES THICK—LEVELLING TO—TO SPANDRELS OF ARCHES—TABLE OF WORK—ABSTRACTING—BILLING.

COMMENCE with the excavation of the surface where necessary, as for basement or sunk stories, taking the net dimensions of length, breadth, and depth of the digging required. Where the excavation does not exceed 6 feet in depth, it is described as digging and throwing out only, but where beyond that the depth must be stated; in addition, specify whether the earth is to be wheeled and spread, or carted away. If wheeled above 20 yards, how far, and if carted away, it is advisable also to state the distance; though this is seldom done, the cost varying according to the distance. Give the nature of the soil, as the labour is regulated by it.

Trenches must be measured and kept separate from the general excavation, and described as "digging to trenches, part filled-in and rammed," the filling-in and ramming taking place after the foundations are in. Some surveyors, however, make a separate item of these latter, in which case the item for the digging is placed with the general excavation. Where there is no concrete, an *allowance* of 6 inches on either side of the bottom course of footings is made, to give the bricklayers room to work in; but where concrete is provided to be used in foundations, allow for only the width of the concrete. Thus, where bottom of footing is three bricks, or 2 feet 3 inches wide, and no concrete provided to be placed under, the width taken for excavation would be 3 feet 3 inches.

Strutting.—When the excavation is deep, and the soil loose, it will require to be strutted, to prevent the ground from falling in. This is measured at per yard run (see Table I.), giving the depth and width of the trench, and is described as "strutting and planking to perpendicular excavation."

Piling.—Where piling is used, it will be necessary to state the number of the piles, with the length in feet, and scantling of each. Then measure the quantity of planking required to be spiked to the fan of the piles. For the labour of driving, take the number, and state the distance each is driven into the ground; also number the ringing, pointing, and shoeing, giving the weight of the ironwork.

Puddling.—In measuring clay puddling over vaults, arches, &c., take the length by the width, and describe the thickness.

Drains.—Describe drains, also state whether jointed in cement or mortar, and the net diameter of the pipes. Number the bends and junctions, which are charged as "extra," the length of the same having been taken with the ordinary pipes; also state whether single or double junctions, and in stating the size it is advisable to give the dimensions of both the pipes it is intended to unite: as 4 inches into 6 inches (or as the case may be).

Gulley-traps are numbered.

Wells and Cesspools.—In measuring wells and cesspools you will have to state the depth and nature of soil, because as the depth becomes greater, the price per yard will proportionally increase.

Where the wells are steined, they are usually numbered, and described as "digging and steining to well," including all gear, tackle, and other materials necessary for its execution, stating the depth and the mean diameter (that is, in clear of the steining), and the class of steining required, whether dry or otherwise. Remember that curbs and after fittings, as pumps and apparatus, are to be taken in addition to the foregoing.

Concrete.—In measuring concrete foundations, the net dimensions are to be taken, and the description given of its composition and the method of throwing in, whether from a stage or otherwise, which will be found in the specification.

Concrete of a less thickness than 12 inches, or where under pavings, &c., is taken at per yard superficial (see Table I.), stating the thickness and description as before; and where extra labour in levelling the surface is required (as to receive paving), it must be so stated.

Where it is filled-in over arches, it is measured at per yard cube, but it must be described as filling-in to spandrels of arches, as the case may be.

I now proceed to give, in tabular form, the mode of measuring the several items in this trade. To economize space as much as possible, I make each table answer two purposes, namely, it gives the order of taking the trade, and also the method of measurement. It will be found very useful as a reference, to see that all the items of the trade are taken, so that nothing may be omitted.

TABLE I.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

DESCRIPTION OF WORK.	HOW MEASURED.
Digging and throwing out	At per yard cube.
„ wheeling and spreading	„
„ and carting away	„
„ to trenches part filled-in and rammed	„
„ to wells and cesspools	„
Concrete in foundations	„
Clay puddling	At per yard super.
Concrete under 12 inches thick	„
Trenches for drains	At per yard run.
Glazed stoneware drain pipe, according to size and description	At per foot run.
Strutting and planking to sides of perpendicular excavation	At per yard run.
Steining to wells	At per number.
Bends and elbows, extra to	„
Single and double junctions, extra to	„

Abstracting.—In abstracting excavators' work, very little or no instruction is necessary, the number of items being so limited. Care must be taken to keep the different works separate; a column or two being allotted to each, according to the size and nature of the job.

In *Billing*, always take the "cubes" first; secondly, the "supers"; thirdly, the "runs"; and lastly, the "numbers." *

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* The order in which the various articles are placed in the Table it is advisable to follow in respect to this trade and all the trades that follow.

CHAPTER III.

BRICKLAYER.

BRICKWORK, HOW VALUED—MEASURING WHERE BUILDING RECTANGULAR — MEASURING FOOTINGS' DEDUCTIONS — EXAMPLE — WINDOW SILLS—STRINGS—WOOD PLATES—CIRCULAR WORK — CHIMNEY BREASTS — FLUES — TRIMMERS — CHIMNEY BARS — ANGLE CHIMNEYS — OVENS AND COPPERS — FIREBRICKS AND LUMPS—FACINGS—POINTING—ARCHES AND VAULTING—GAUGED ARCHES — AXED ARCHES — RELIEVING ARCHES — CENTERING — GROINED ARCHES—CIRCULAR BRICKWORK—BRICKWORK IN CEMENT—BRICKNOGGING—BRICK PAVING—TILE PAVING—RENDERING — BRICK-ON-EDGE COPING — POINTING — TILE CREASING — DAMP COURSE — HOOP-IRON BOND — DRAINS—GULLY TRAPS—CESSPOOLS—ABSTRACTING FOR THIS TRADE—CUBE BRICKWORK—TABLE II.—TILES:—HOW MEASURED—ALLOWANCES TO BE MADE ON PLAIN TILING—PANTILING—FILLETINGS—HIP RAFTER, TO MEASURE—TABLE III.

BRICKWORK is usually valued at per rod of 272 superficial feet, 1½ brick or 13½ inches thick, all work of whatever thickness being reduced to this standard. Should the work, however, be under this thickness, it must be kept separate from the general work, and described according to its nature; also where the joints have to be stuck on both sides, as, for example, in boundary walls.

In measuring walls take the length by the height, and describe the thickness. The several thicknesses are reduced to the standard in the abstract, as will be shown hereafter. Where the building is rectangular, take the external face of two walls, and the internal face of the other two, for the length see Fig. 1. Some surveyors keep these same dimensions for the concrete, footings, and even digging to trenches, as in the latter cases the altered lengths, when added together, amount to the same thing, the average being the same.

Commence with the foundations, taking from the base to the top for the height of the footings, and average them for the thickness. In the two following examples, Figs. 2 and 3,

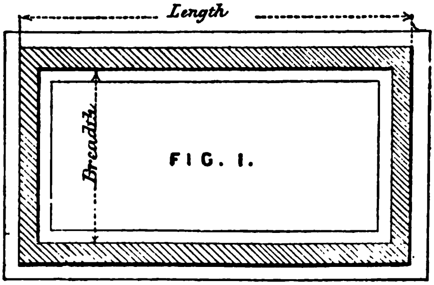


FIG. I.

FIG. 2.

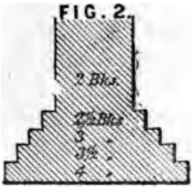
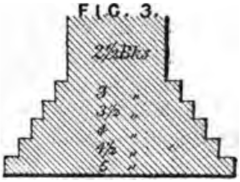


FIG. 3.

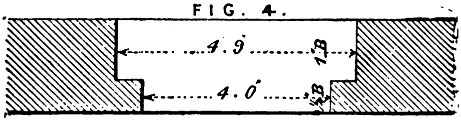


the average would be respectively 3¼ bricks and 4 bricks. Taking the former, and supposing the wall to be 50 feet long, we should have

50·0 1·0	50·0	3¼ brick footing.

After the footings, take the wall up to under side of ground-floor joists, and so on, floor by floor, or as high as the wall continues of the same thickness, taking care to make the several additions and deductions as they occur. A little care is necessary when making deductions. In deducting openings to windows or doors, where there is a reveal, as Fig. 4, two dimensions will be necessary, the deduction for the ½ brick being

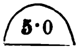
FIG. 4.



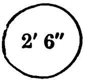
less than that for the 1 brick; thus, supposing the height to be 6 feet,

4·0 6·0	24·0	½ B. ddt. window.
		4·0 2 reveals 9 4·9 6·0 1 reveal 4½ 6·4½
4·9 6·4½	30·3	1 B. ddt. window.

And in the case of windows, should there be any deduction for window back, it will have to be taken in addition to the foregoing.

No deduction is made for window sills, or strings under 6 inches in height, nor for any woodwork under that depth; and where wall plates are placed above the walls, 2 inches is added to the wall, and charged as brickwork to pay for the cost of bedding. Circular and semicircular works are indicated as such in the dimension book, and the diameter figured inside; 

thus where the item is a cube, the depth or height is placed under: thus

 10·0	49·0875	Cube brickwork to circular chimney.

Chimney-breasts and flues are measured similarly to the other work, taking first the footings, and so on, floor by floor, stating the thickness beyond the wall, and deducting only for the openings for fire-places, the flues being measured in, as if solid, and afterwards numbered for "coring" and "pargetting."

It is also advisable at the time of measuring the chimney breasts to take the trimmers, which are measured and valued by the foot superficial, taking the length by the breadth. They are described as "half-brick trimmers in cement," the centering being measured at the same time, and afterwards abstracted in the carpenter. Take also the wrought-iron chimney bars to carry arch over opening at per foot run, according to specification, generally 18 inches longer than the opening. This is afterwards abstracted in the smith's bill, and valued at per weight. Angle chimneys (Fig. 5) are measured as solid, and afterwards reduced to ordinary standard; thus, presuming the height to be 12 feet, we should have

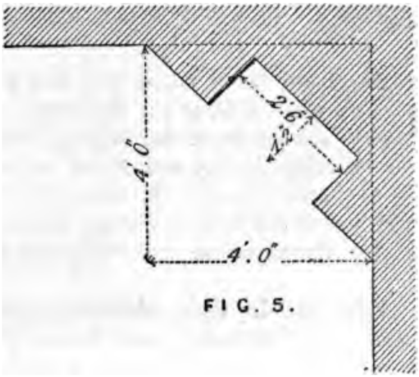


FIG. 5.

½	12·0		
	4·0		
	4·0	96·0	Cube brickwork in angle breast.
	2·6	8·9	1½ brick ddt. opening.
	3·6		

Ovens and coppers are measured as solid brickwork, deductions being made for the ash-holes only.

Firebricks and lumps are charged as "extra."

Facings.—When the brickwork is faced with a superior class brick to that used in the general work, that is charged as "extra only" to the brickwork, and measured and valued at per foot superficial as "extra only to picked stock facing," white Suffolk facing, or as the case may be, including pointing; and if the reveals to windows and doors be not plastered, they will have to be added and included in the facing; also add as much of the return walls as show the facing bricks. Make all the deductions as for ordinary brickwork, including the arches, which are charged separately.

Pointing is measured sometimes by the foot super, and sometimes by the yard, and sometimes by the square of 100 feet superficial. The former, however, is the more ordinary way of measuring it, and I think the best, and have therefore so placed it in Table II.

Cuttings.—Cuttings are measured at per foot super, when over 6 inches wide; under that, at per foot run. It will also be necessary to state the nature of the cutting, whether rough cutting, as over relieving arches, and where not seen, if fair cutting, cutting to skewbacks, &c. Bird's-mouth cuttings and cutting to squint quoins are measured at per foot run, and described according to the nature of the work, whether "rough" or "fair."

Arches and Vaulting.—In their admeasurement, take the length by the mean girth between the *intrados* and the *extrados;* and state the thickness. This is afterwards reduced to the standard rod, and valued accordingly.

Gauged Arches, Axed Arches, &c., are measured by taking the width of the opening between the reveals, and add to the dimension the projection of one skewback for the length, then take the height thus, referring to Fig. 6.

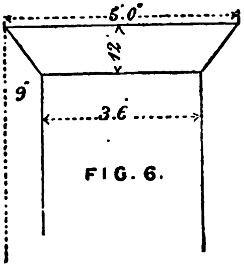


FIG. 6.

	'	"
Opening, ...	3	6
1 Skewback ..		9
	4	3

Dimensions	Squared	Description
4 · 3 1 · 0	4 · 3.	Extra to gauged arch in yellow malms, set in putty (or as the case may be).
3 · 6 9	2 · 7.	Add soffit.
	6 · 10	

It will be necessary to deduct these arches from the "facings."

Relieving Arches are charged as extra to the ordinary brickwork, they having been taken and included in the ordinary walling. They are afterwards averaged (that is, the openings) and the width of soffit stated thus:—

No. 24.—Extra only to relieving arches in cement, in three half-brick rims to 4-ft. openings (average), and 9 in. soffit.

Centering, it will be seen by the Table, is taken at per foot super, measuring the soffit of the arch. The turning pieces are measured at per foot run, stating the length and width of soffit only.

It is also advisable to measure the cuttings after the arches for the sake of convenience: thus, in the example just given, the cutting would be taken and described as:—

2	1·2		
	7	1·4	Fair cut skewbacks.

If the arch be segmental, it will be necessary to describe the cutting as cutting to face bricks to fit segmental arches, or as circular, fair cutting where the arch is semicircular, greater labour being entailed where the cutting is circular. It should be particularly observed that all cuttings should be described as they are executed.

Groined arches are measured the same as ordinary arches. The cutting to groin being, however, taken separately at per foot run.

Circular Brickwork must be kept separate from the straight, and described accordingly. If under 20 feet diameter, it is customary to state the radius. Some surveyors allow 1¼ times the straight to meet the additional labour, without describing the work as circular; but this should not be done, as all work should be described in the bill according to the nature of its execution, whether circular or straight. It is always understood to be straight unless otherwise specified.

Brickwork in Cement is measured with the ordinary brickwork in mortar, and an extra charge made to meet the increased price for the cement. It is, therefore, measured first with the brickwork in mortar; and the same item appears a second time as *extra only* in cement. Items, however, other than the plain brickwork are specified, without the extra, as trimmer arches in cement, &c.

It may be as well to observe here that all brickwork is understood to be executed in mortar unless specified to the contrary.

The measurement of *bricknogging* includes the timbers, but there must be deductions therefrom for the opening where they occur.

Brick Paving.—State whether brick on edge or brick flat, also whether in cement or mortar, &c., also the quality of the bricks.

Tile paving requires no explanation; the Table showing all that is necessary.

Rendering in cement by bricklayer is sometimes measured by the yard, and sometimes by the foot superficial, the former, however, is more generally adopted; and therefore I have so placed it in the Table. It is described as "rendering in cement from the trowel."

Brick-on-edge Coping.—Measured, as will be seen, at per foot run, stating thickness of wall, and described as "extra only" to brick on edge in cement, it having been firstly measured in with the brickwork in mortar.

Pointing is taken and measured similarly to "facings." The description is taken from specification, as tuck pointing, &c., and the nature of the work should also be stated, whether to old or new fronts, and if scaffolding is required:—

In measuring *tile creasing*, state if bedded in cement or mortar, and if laid double.

In taking slate or other *damp course*, it is necessary to give exact description.

Hoop-iron bond is taken at per foot run, giving size and description, whether tarred and sanded, or as the case may be. It is afterwards abstracted, brought into the smith's bill, and charged at per weight.

Drains require to be described. If barrel drains, it is best to measure them at per foot run, stating net diameter and number of half-bricks in thicknesses of the ring, including centering, &c.

Cesspools, it will be seen, are numbered, giving the depth, and diameter, and description of method of finishing. Number the drain pipes discharging into same, and describe as "extra to making good to drain pipes."

Abstracting.—In abstracting this trade, it is necessary to allot a certain number of columns to the several descriptions of work, as recommended in the "Excavator"; but great care and circumspection will be necessary in the uninitiated to obtain a proper arrangement. It is, therefore, advisable to enter the several items as widely apart as possible, leaving, of course, greater space for those that occur the more frequently.

In an ordinary job, one column will suffice for cube brickwork, one for one brick, and another for one and a half brick, with an additional column between them for the deductions. Deductions are made where practicable on the dimension paper (as, for example, where the deduction occurs after the addition), so saving unnecessary labour.

The next three or four columns will be taken up with "extras,"—as brickwork in cement, facing bricks, arches, and the other superficial quantities.

We then allot the remainder to the "runs," or lineal dimensions, leaving two or three columns for the numbers, and any remarks.

With respect to the brickwork, as the standard adopted consists of 272 feet superficial of 1½ brick thick, all brickwork will have to be reduced to this thickness.

This is accomplished in the first place by reducing the brickwork, where above 1½ brick, to either 1 brick or 1½ brick, whichever is the simplest, and abstracting it accordingly.

Then, after it is all abstracted, bring the sum of the 1 brick into 1½ brick by multiplying it by ⅔rds.

If we take the case already given with respect to footings, we have 50 feet of 3¼ brick, which can either be reduced to 162 feet 6 inches 1 brick, or 108 feet 4 inches of 1½ brick; but when the latter can be as easily done as the former, it is advisable to do it. It will be necessary to divide some dimensions between the two: thus, supposing it to be 2½ bricks, we should have 50 feet of 1-inch brick and 50 of 1½ brick in the abstracting, this being the easier method of reducing the quantity.

Cube brickwork is abstracted as such. It is afterwards reduced to the standard of 1½ brick by multiplying by 8, and dividing by 9.

TABLE II.

This Table has a double use; it shows the order of taking the items of this Trade, and the method of Measurement.

DESCRIPTION OF WORK.	HOW MEASURED.
Stock brickwork in mortar	At per rod reduced.
„ to fence walls, or walls under 1½ brick thick ..	„
„ circular	„
Brickwork in cement	„
Facings (extra only to), stating whether picked stock, yellow malms, white Suffolks, or as the case may be, always placing the inferior quality first; and whether including pointing	At per foot super.
Gauged and axed arches (extra only to)	„
Rough cutting	„
Fair cutting	„
Circular fair cutting	„
And all cuttings over 6 inches wide	„
Pointing	„
Half-brick walls in cement	„
Trimmer arches in cement	„
Damp course	„
Bricknogging, flat or on edge	At per yard super.
Brick paving do.	„
Tile paving	„
Rendering in cement	„
Cutting to bird's-mouth[*]	At per foot run.
Squint quoins	
Chamfers	„
Splays under 6 in. wide	„
Beads and quirks	„
Chases in brickwork	„
Pointing to flashings	„
Lime and hair or cement filletings	„
Brick-on-edge coping	„
Tile creasing	„
Fascias	„

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[*] Where the return wall of a building is otherwise than at right angles with the front, the angle bricks will require cutting to the rake of the return wall. That cutting which is made to the inside angle is called cutting to bird's-mouth, and that to the outside angle as cutting to squint quoins.

Description of Work.	How Measured.
Cornices	At per foot run.
Frames bedded and pointed	At per number.
Flues, cored and pargetted	„
Setting to stoves	„
„ „ range	„
Chimney-pots and setting	„
Setting chimney-pieces	„
Building-in ventilators and air bricks	„
Ends of sills made good	„
„ rain-water pipes made good to drain	„
„ timbers cut and pinned	„
Stops to chamfer, mouldings, &c.	„
Returns „ „	„
Mitres „ „	„
Angles „ „	„

[Some take the last four items under the items to which they refer, but I think they are more usually taken in this order.]

Cesspools, with description	At per number.

Tiler.

In measuring tiling, whether plain, pan, or ornamental, take the extreme length of eaves from out to out, by the breadth from eaves to ridge, measuring the latter from the section.

Twice this item, if the building is rectangular, will give the superficial area of tiling for the roof.

If the building is hipped at both or at one end, the dimensions will still be taken as above from out to out, as whether the roof be hipped or gabled, the superficial area will be about the same; and, of course, this plan materially shortens the labour.

The following allowances in the measurement of plain and pan tiling must be made upon the net superficial area of the tiling.

In Plain Tiling.

	Inches.
For eaves	4 extra.
„ dripping ditto	6 „
„ cutting hips, &c.	3 „
„ valleys	12 „

In Pantiling.

For cutting to hips, splays, &c., at per foot run, described as "splayed, cutting and waste."

For cutting to hips and ridges at per foot run.

Take the filletings at per foot run, describing whether in cement or mortar. Also, the pointing to verge. Number the hip hooks and T nails, and state in how many oils they are to be painted.

To ascertain the length of the hip rafter, there are two or three methods, but the following is perhaps the simplest and best.

Make the hip line on the roof plan the base of a right-angled triangle, the perpendicular of which is the height of the roof as delineated on the elevation, and the hypothenuse will be the length of the hip or valley. Taking the example of the plan of roof given, of which A B is the hip, make B C at right angles to A B, and the same length as the roof is high. Then A C will be the required length of the hip.

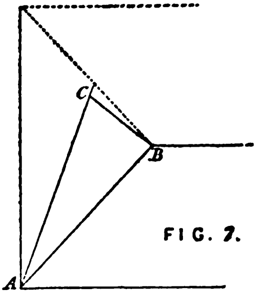

FIG. 7.

TABLE III.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Plain tiling	At per square of 100 ft. superficial.
Pantiling	"
Ridge tiles	At per foot run.
Hip tiles	"
Valley tiles	"
Plain tile creasing	"
Mitres to hips and ridges ..	At per number.
Hip and T hooks	"

CHAPTER IV.

SLATER AND SLATE MASON.

MEASURING SLATING—ADDITION TO—EXAMPLE OF—ALLOWANCE FOR HIPS AND VALLEYS—IRREGULAR CUTTING—DEDUCTIONS—CIRCULAR—DESCRIPTION OF SLATE USED—SIZES OF SLATES—WHICH COMMONLY USED—FANCY SLATING—RIDGES—HOW SET—HIPS — FILLETINGS — DAMP COURSE — CREASING — SHELVES — WORK TO—CISTERNS—SINKS—PAVING—WORK TO—SKIRTINGS—LOUVRES—LABOUR ON SURFACES—CHIMNEY-PIECES—FIXING—TABLE IV.—SHORT WAY OF FINDING QUANTITY OF SLATES.

IN measuring slating, take the length by the breadth, the latter being taken from the edge of the eaves to the top of ridge as in the tiles. Add to this whatever appears of the lower course of slates. Thus supposing the slates to be countesses (20 by 10) and laid to a 2-inch lap, the bottom course will show 8 inches. This would be the required addition to make to the measurement.

Allowance for hips and valleys is thus made. Take the length by 6 inches wide on each side, and add to it the measurement as an allowance for cutting and waste, the hip being measured as described in tiles. In addition, make an allowance of 6 inches wide by the length for all irregular cuttings, as, for example, to angle chimneys. Make deductions as they appear.

Where the slating is laid circular it must be kept separate from the straight, and described accordingly. It is measured similarly to the straight, with the same allowances.

Be careful to state the description of slating used, with the size (whether duchesses, countesses, &c. &c.), also specify the lap, also the quality of nails, whether copper, zinc, &c., and the number to each slate.

It may be advisable here to give the size of slates generally in use—

	In.		In.		In.		In.
Queens	36	by	24	Countesses	20	by	10
Imperials	30	„	24	Viscountesses	18	„	9
Princesses	24	„	14	Ladies	16	„	8
Duchesses	24	„	12	Doubles	13	„	6

Note.—Of these the duchess and countess are the more commonly used. Of course it will be necessary to keep the different descriptions of slating separate, also to state whether fancy slating—slating laid diagonally being so called.* Should the slating be required to be cut in any form, a sketch would the better exemplify the description, and should be given to enable the contractors to estimate with greater certainty. Slate ridges and cresting are measured at per foot run. State whether set in red lead, putty, and screws, &c. Slate hips are measured at per foot run, as will be seen by perusal of the Table IV. Measure all filletings, and state whether in lime and hair mortar or cement. These are billed with the bricklayers' work, as before described.

Damp Course.—Take the length by the width, and state whether laid double, and if bedded in cement.

Creasing.—In taking this item it is necessary to state if in cement.

Shelves.—Take the length by the width, and include in such measurement any portion let into walls.

The edges, where rubbed down or rounded, to be taken at per foot run, and described how finished.

Rebates, grooves, tongues, &c., are also measured at per foot run. If the joints be cemented with red lead or putty, it must be stated.

The cutting and pinning into wall is also taken at per foot run. See Table IV.

Cisterns are usually numbered, stating the description of slating with the thickness required for sides and bottom, and the capacity of water required in gallons. It is advisable also to give the inside or net dimensions of the cistern, as where the bottom is thicker than the sides, as is customary, it will be impossible to form a correct estimate where this is not done. Describe how it is to be put together, specifying the bolts and nuts. All holes for plumber are taken at per number "extra." It should be also stated if fixed, as otherwise this will be afterwards charged as "extra."

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* I avoid all questions of reasons as to whether it should be so called. I desire only to *deal at present* with that which exists.

Sinks.—Give the dimensions, length, breadth, and depth, and full description, stating if fixed, including cutting and pinning into wall, &c. All holes are to be taken as "extra." If rebated, it must be stated, as it is an "extra." See the Table as to how measured.

Paving.—It is necessary to describe as to the finishing to surface whether rubbed, &c., and if the edges are sawn or rubbed, they will be measured separately at per foot run.

Skirtings.—Take the length and describe the width and thickness of the slate, including all screws, and drilling holes.

Louvres.—In taking these it is necessary to state the depth and thickness of slate, and the surfaces if planed, &c., including edges. Number the fair ends, and the fitting to stone or other grooves.

Labour on surfaces, as planing, rubbing, enamelling, is to be taken at per foot superficial.

Chimney-pieces are usually numbered and a price affixed, the price and value thereof differing almost as much as in the case of marble.

The fixing is taken under the head of "bricklayer."

TABLE IV.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Slating	At per square of 100 ft. super.
Slate ridging	" " foot run.
" hips	"
Slate damp course	At per foot super.
" shelves	"
" paving	"
Slate creasing	At per foot run.
" louvres	"
" skirtings	"
Labour to planing to surface	At per foot super.
" edges, grooves, rebates, &c. ..	" run.
Slate cisterns	At per number.
" sinks	"
Cutting holes for plumber (extra) ..	"

In concluding this trade I would mention a "short way" to find the quantity of slates required. Should the reader wish to find the amount of slates necessary to cover any given area,—take the length the third slate covers the first from the length of the slate, and divide the remainder by two. Multiply the result by the width of the slate, and the product will be the number of square inches of the surface of a single slate. The total area of the roof divided by this number will give the total of slate required. It will be necessary to make an addition for double course at eaves, and for the cuttings to hips, &c.

CHAPTER V.

MASON.

DIFFERENCE OF OPINION AS TO MEASURING—OPINION OF MASONS—CONFINED TO DESCRIPTION OF WORK—WANT OF KNOWLEDGE OF SURVEYOR—LABOUR ON STONEWORK—METHODS OF MEASURING—HOW SOME SURVEYORS TAKE—SMALL JOBS—WIDE TENDERS, CAUSE OF—RUBBLE-STONE WALLING—MEASUREMENT OF, DEPENDS ON LOCALITY—BY YARD SUPER—BY PERCHES—BY YARD CUBE—DEDUCTIONS FROM—EXTRAS TO—QUOINS—WHEN OF BRICK—BRICK LINING—DEDUCTIONS FROM—WROUGHT STONEWORK—HOW TO BE TAKEN—ASHLAR—BLOCK-STONE—IRREGULAR SHAPES—EXAMPLE OF—PLAIN WORK—SUNK WORK CIRCULAR—CIRCULAR WORK—CIRCULAR SUNK WORK—CIRCULAR CIRCULAR WORK—MOULDED WORK—REASONS WHY DEFINITIONS GIVEN—YORKSHIRE STONE—DIFFERENT MEASUREMENT FROM OTHER STONE—WHY—HOISTING AND SETTING—OVER 6 FEET IN LENGTH—PAVING—LABOUR TO—LANDINGS—LABOUR TO—EXCEEDING 6 INCHES THICKNESS—STONE OVER 30 FEET SUPER—HEARTHS—SHELVES—CURBS, COPING, &C.—EXAMPLE OF—STEPS—RISERS—THRESHOLDS—SILLS—CRIBS—CRIBSTONES—TEMPLATES—PORTLAND, BATH, AND OTHER BUILDING STONE—HOW MEASURED—LABOUR TO—HOISTING OVER 40 FEET—HALF-SAWING—EXPLANATION OF—ABSTRACTING OF—PLAIN WORK—PLAIN FACE—SUNK WORK—MOULDED WORK—GROOVES, &C.—CHIMNEY-PIECES—PAVING—LANDINGS—NUMBERS—CARVING—EXAMPLE OF MEASURING—SPANDREL STEPS—WINDOW SILL—ARCH STONE—COPING—WINDOW HEAD—TABLE SHOWING CONTRAST BETWEEN ENGLISH AND SCOTCH MEASUREMENTS OF STONEWORK.

PROBABLY there is no trade about which so much difference of opinion exists in the method of measuring as there is with the mason. And who shall say which method is right? Each surveyor holds to his own idea as the correct one; and if we refer to the really practical men—the masons themselves—I venture to state that we shall get just as many conflicting opinions as are to be found amongst those whe study simply the theory. Happily, however, the differences that do exist are principally confined to the descriptions of the labours expended upon the stonework; and this arises in some degree from a want of knowledge on the part of the surveyor as to how the stone should be worked, or what preparatory labour should be taken on stonework in cases of elaborate detail; consequently matters of doubt are apt to be expressed incorrectly. It should always be observed that the labour upon stonework is to be measured and described according to the nature of its execution, and should at the same time be measured in the order in which the labours are worked, the inferior work generally being done first and the superior faces last. In proceeding to the measurement of stonework, there will of necessity be many who differ with the methods I advocate, and which I have adopted in my own practice. To such I say, consider your own method and that advocated by me, and compare them. Where differences exist, ascertain why one surveyor should take certain works differently to another. If some such course as this be pursued we should ultimately arrive at a time when an uniformity of measurement will be adopted, and all such differences shall cease to exist. It is a well-known fact that many surveyors take out the labour on stonework somewhat excessively, so as to cover any omission in quantity or error of description, which through their incapacity might arise. It is also well known that the more elaborately the work is measured the greater will be the builder's estimate. Still, this should not deter men from pursuing a course which is manifestly correct. We frequently see surveyors, in small jobs especially, omitting to measure labour at all, trusting to descriptions and sketches—thus avoiding what they consider unnecessary trouble. And I venture to observe that very few surveyors or builders could estimate, unless it be approximately, what would be the value of it at a glance; and in cases where such works are to be carried out to any extent, half-a-dozen builders would tender as widely different as those that are so constantly brought before our gaze weekly in the professional papers; and who shall say that these very cases do not arise from some such cause? In l jobs, such works as string-courses, copings, plinths, &c.,

might be measured in this way; but even then, I think, this method is to be deprecated, and I would recommend that the ordinary, or more professional mode be adhered to.

There is one description of stonework, however, which requires very little practical knowledge in ascertaining the way of measurement, and as this is the simplest, and of a much less expensive nature than the ordinary descriptions, I will treat of it firstly. I refer to the stone-rubble walling; and although there are so many kinds of this class of stonework, they are all measured in one uniform way, which way, however, depends upon the standards adopted in the several localities in which the stone abounds. In neighbourhoods within the vicinity of the stone quarries, and where stonework is cheaper than brickwork, it is frequently—I may say generally—the case for houses, &c., to be built of the stone in what I may term its natural state—that is, unworked; and as I have just stated that in such cases the method of measurement depends upon the locality, and as various localities have different methods, it is always advisable, where a surveyor has to deal with it, that he should obtain from some one in the neighbourhood what is the local standard of measurement. That which I have found to be the most usual rule in such cases is to measure it by the yard superficial, and state the thickness of the wall and the description of the work, whether coursed or uncoursed, or as the case may be. In some districts, again, this kind of stonework is measured by the perch of 18 superficial feet of an uniform thickness of 24 inches—all thicknesses of walls being reduced to this standard, after the same manner that brickwork is reduced to the rod of 272 feet super of 1½ brick thick. And another method is to measure it by the cubic yard. In either of the latter cases, all labour applied to the face of the work would have to be taken and described separately, such as scabbling, &c., which in the first case—viz. where measured by the yard superficial and the thickness stated—would be obviated. Where the labour is taken separately, measure it by the foot superficial. Window and other arches, where executed in this description of material, would be measured in with the ordinary walling, and a second dimension taken of the arch, which would be described as "extra to rough hammer-dressed arches, 16 inches high, with radiating joints," or as the case may be. This is measured by the foot run. "Extra labour to forming small openings" are better numbered. Quoins, where executed of different material to the walling, must be taken separately; and where laid in regular blocks, the labour must be taken out in the manner hereafter to be explained. Where, however, it is of the same material as the wall, it should be measured in with it, and any extra labour in working and setting should be measured separately. Where the quoins are of brickwork, it is customary to measure them by the foot run; and as all descriptions of rubble-walling should be provided with an internal lining of brickwork to prevent osmatic action, brickwork not being so susceptible to the wet as stone, and it also presents a better surface to plaster against, it is usual in such cases to measure the brickwork at the same time as the stonework. The brickwork would be reduced to the rod in the ordinary manner, but will require to be described separately from the other as "brickwork in lining to rubble-stone walling."

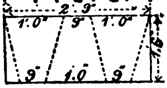
I may observe, in concluding this description of stonework, that it is only customary to deduct other kinds of stonework and other material where it is over 4 inches in thickness.

Proceeding then to the measurement of wrought stonework, or stonework upon which a much greater degree of labour is expended in the working of the faces, beds, and joints, we arrive at that portion of our subject which requires more experience and a greater amount of care.

Each stone must be taken separately, the cubical contents being ascertained firstly, and the labours taken lastly. Ashlar work, however, is usually taken, including all labours, in beds and joints, either by the foot superficial, stating the average thickness, or by the foot cubic; but in the latter case the face will have to be measured separately and described as worked, whether rubbed or otherwise, whereas in the former this is obviated by including it in the description.

In measuring block-stone, take the full dimensions of the stonework as it comes to the banker. Adopt an uniform method in taking the dimensions. The usual way is to take, firstly, the length; secondly, the depth; and lastly, the height. In cases of *irregular pieces* of stonework, the dimensions must be taken of the smallest rectangular block out of which the said stone can be cut; consequently it is evident that were every such piece of stone cut in this way there would be considerable waste. This, however, is not always the case, as a clever mason will consider before cutting the stone how he can economize it by sawing two or three irregular pieces out of one stone, and this is easily perceived in the case of arch stones, where the several stones would be measured the full size, and the *oblique* surfaces taken as sunk work, as will be hereafter explained. Take the example shown in Fig. 8; here we have three arch stones, which, taking the largest dimensions for the measurement of each stone, would be, presuming the thickness to be 12 inches,

FIG. 8.



3	1·0		
	1·6		
	1·0	4·6	Cube stone.

But looking at the sketch, it is evident that the three stones could be cut out of a single block 2 feet 9 inches long,

2·9		
1·6		Cube stone,
1·0	4·2	

and that a saving would be effected by the mason to the extent of over 4 inches. Still, however, the former is the method which is always carried out, and it would not be wise for me at present, perhaps, to advocate any other course.

The following are the descriptions of the various labours executed on stonework:—

Plain work consists of the removal of the irregularities of the stone with the least possible waste of material labour, so as to obtain what the term implies—a plain face, or even surface.

Sunk work is formed by working below the flat surface, as in rebates, weatherings, sinkings, &c., and it may be either straight or circular, but when circular it should be kept separate from the straight, and described as

Sunk work circular.—Fig. 9 is a sketch of the latter.

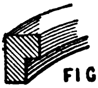


FIG. 9.

Circular work comprises the labour to concave and convex surfaces, such as to circular soffits, shafts of columns, and the like.

Circular sunk work consists of the labour required to form circular sinkings as distinguished from straight sinkings.

Circular circular work, or spherical work, as it is sometimes called, comprises the labour in forming niche heads, domes, and the like, being circular on plan and circular in elevation.

Moulded work comprises the labour in forming mouldings in stonework, and may be either straight or circular; where the latter, as to bases to columns and over arches, it must be kept separate from the straight.

I have thought it necessary to give the foregoing definitions for the benefit of those of my readers whose experience of the subject has been insufficient for them to find them out practically, but I shall hereafter show the method of measuring them by a series of examples; such being, I think, of greater advantage to the student than simply by my defining certain rules, and leaving him to carry them into practice.

YORKSHIRE STONE.

In proceeding to treat of the several kinds of worked stones, I will speak firstly of Yorkshire stone. The measurement of this stone in London varies from that of the other stonework, inasmuch as, in many respects, it is customary to combine the material and labour in the one item, instead of keeping them separate, as explained of stonework in general. This arises in great measure from the fact that the labour executed upon the stone is, in the majority of cases, worked at the quarries, and sent up to London in a finished state, ready for setting. And, moreover, this description of stonework occupies such a limited and ordinary position in a building, that any further detail than that usually given by quantity-surveyors would be unnecessary Of course, where used to any large extent, or where it occupies the positions now taken up by the stones in more general use, *viz. in walling, &c.*—as, for example, Portland or Bath stones

—it would have to be measured in the same way as these stones, as will be explained hereafter.

> NOTE.—It is always understood that "hoisting and setting" is to be included on each of the several items for the stonework; and in the case of Portland and other stones it is included in the cube blocks of the stone; and in the latter case all stonework more than 40 feet above the ground must be kept separate from that below that height.
>
> Also, any stone which exceeds 6 feet in length must be kept separate from the general item, and be described as scantling-lengths, and the different sizes stated.

Paving.—Take the length by the width, and state the thickness, and the description of the labour executed upon the stone, whether tooled or otherwise. State also if laid in regular courses, and if bedded and jointed in mortar, cement, or as the case may be. Where the plan is irregular, and it becomes necessary to cut the stonework to fit against splays, or irregular projections, it will be necessary to measure the cutting separately. This is taken by the foot run, and described as "cutting and waste to (2½ inches) York paving," stating the thickness. No allowance, however, is made in the superficial area of the paving to meet such contingencies, the *net* surface only being measured, the additional cost being provided for by the item for "cutting and waste." Any circular cutting should be kept separate from the straight. Number any holes for pipes, &c.

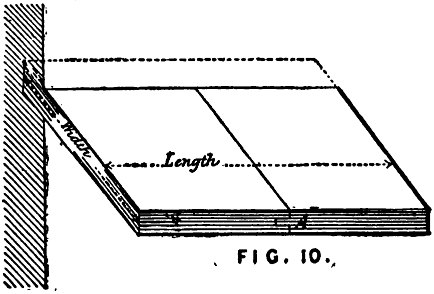


FIG. 10.

Landings are measured similarly to paving, and my remarks thereon will apply here. The student will have to include in the dimension for the length or width the portion tailed into the wall, as per sketch, Fig. 10. In the description state whether both faces are worked, and, if so, the nature of the work on each face, as it is frequently the case for one face to be rubbed, whilst the other is only tooled. Cutting and waste would be measured as described to paving, and any rubbed or tooled edges would be taken in the same way. Where the thickness of the landing exceeds 6 inches, it is customary to take the edges by the foot superficial. Joggle joints, Fig. A (sketch 10), are measured by the foot run, and described as "joggle joint and cement to 4-inch landing," or as the case may be, stating the thickness of the landing. Any circular cuttings would have to be kept separate from the straight, but if preferred may be taken with the same, and a second dimension taken for the extra labour in forming circular cutting, beyond the price allowed for the straight. I think the former the better plan of the two, however, and one that is more in vogue. Number all mortises for rails, newels, &c., and state whether they include "running with lead" to the rails or newals when they are fixed, though the labour in fixing the same would of course be included in the Smith, the lead, however, being usually taken with the mortise.

It should be remembered that when the length of a landing exceeds 6 feet, or the area of any one stone contains more than 30 superficial feet, it must be kept separate, and specified accordingly.

Hearths.—In measuring hearths, take the full dimensions, and specify the thickness of the material. State whether rubbed, or otherwise, and number the notchings for the chimney-pieces, stating whether single or double.

Shelves, &c., are measured in a similar manner to the foregoing, including the cutting and pinning to walls—all worked edges, &c., being taken as described to landings.

Curbs, Copings, &c., are measured by the foot run, stating the length, and giving scantlings, the largest dimension being taken each way. Specify the nature of the workmanship, whether tooled, rubbed, or otherwise; and in the case of copings, it is always preferable to give a sketch in addition to the description. Thus sketch Fig. 11 would be described as—

20·0		12 in. × 4 in. tooled, weathered, and throated on both edges, York coping, as sketch, including all joints.

Some surveyors number the joints to copings, curbs, &c., but as it is an understood fact that one joint is allowed to every 3 feet of stone, I have always considered it unnecessary to number them, and accordingly include them in the one item with the stone. It will, however, be necessary to number all cramps, plugs, &c., stating whether galvanized iron or otherwise, and including running with lead. Also specifying the length of the same, and if plugs are single or double. Where angle stones occur they must be kept separate from the straight, and specified accordingly.

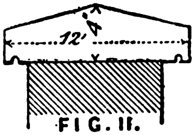


FIG. 11.

Steps are measured by the foot run, stating the length and scantlings, and giving description of the work. For the length include the portion pinned into the wall; and where there is more than one step, take a running dimension the length of the step, for the labour in forming "back joint" or rebate.

Risers are also measured in this way:—Enumerate the "fair ends" and the "ends cut and pinned to wall in cement"; and also number all mortises for iron balusters and newels, as described to landings, and also any mortises for door posts.

Thresholds are measured as the foregoing.

Sills.—Measure by the foot run, taking the length of the sill, and state the width and thickness. Describe the nature of the work on the same, whether tooled, weathered, and throated, or as the case may be. Number the "fair ends," the "ends cut and pinned to wall," and also for "bedding hollow and making" good to sills.

Sinks are usually numbered, the dimensions being given, including the portions pinned into the wall. State the thickness or total depth of the sink; and some surveyors, in addition give the depth of the sinking in the stone, though this course is exceptional. Take the labour to cutting and pinning to wall in the manner already prescribed to other work, viz. by the foot run. Should the sink have one or more rounded corners, number them; and also enumerate the rebated hole for bell trap. Stone bearers to sink would be also measured by the foot superficial.

Sink-stones are also numbered, stating the sizes and the thickness of the stone, and the number of holes, and whether dished or otherwise.

Templates are numbered, giving dimensions and stating how worked, whether tooled or otherwise; also whether laid in cement.

PORTLAND, BATH, AND OTHER BUILDING STONES.

I now proceed to treat of Portland, Bath, and the other building stones, which are in more general use on account of their being better adapted for building purposes, and their being capable, owing to their texture, of receiving a greater amount of decorative treatment than the stones already mentioned.

In dealing, then, with these stones, it is customary to take the cubical contents of the stone first, and then the various labours executed upon it, keeping the stone and labour separate. There is, however, an exception to this rule in the case of ashlar work, which is measured by the foot superficial, including all beds and joints, stating the average thickness of the stone, as shown in the Table. With this exception, the stonework must be measured by the foot cube, and the labours upon the various faces taken separately, according to the execution. It is better to measure the labours in a particular order, and it is recommended that the inferior be taken first, beginning with the half-sawing, then taking the beds and joints, plain face, sunk face, moulded face, &c. Such a system enables the student to find any dimension afterwards without difficulty. Commence at the lower portion of the house, and work from left to right, as recommended in "Bricklayer." All stonework 3 inches thick and under is to be measured superficially; over that thickness to be taken at per foot cube. Proceeding, then, to the measurement of the stone, it is also advisable to keep to one uniform method of taking the dimensions of the several blocks to obtain the cubical contents; as I have already observed all labour and material in hoisting and setting the stones is included in the item for the cube stone. Where the stonework is raised above 40 feet from the ground, it must form a separate item from that below that height.

I have already, in a previous article, given the definitions of the ordinary labours upon stonework, and I will now endeavour to explain the methods of measurement I adopt, and give examples in illustration of my own practice, because I am sure my readers will consider that examples of actual practice are far preferable and easier to understand than theoretical principles, which, even if carefully read, are not thoroughly understood, and are therefore soon forgotten.

As I have before observed, the stone is to be measured as it is actually intended to be worked, and the net surfaces for the labour only to be taken. I will speak of the labours in the order already prescribed.

Half-Sawing is taken upon all sides of the stone upon which no other labour is to be executed, all other labours including this item. It is generally applied to the backs of stone, which would require no additional labour, but it must also be taken on every side when the stone is laid upon or against brickwork. Of course when certain faces are left rough as it comes from the quarry, no sawing or other labour would be taken.

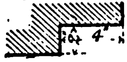
For the instruction of those of my readers who may be yet quite novices in quantity surveying, and who consequently need information not necessary to the more advanced, I would mention that by taking half-sawing to each stone, we equalize this labour upon the several stones which are sawn, as the sawing itself would apply to two stones, both being sawn at one and the same time. After the whole of the half-sawing, however, is brought into the abstract, it should be divided by two, and billed as "sawing," though many surveyors would keep it and bill it as "half-sawing." I prefer the former, as sawyers are paid according to the amount of the "sawing," not "half-sawing," which they execute. This point, however, is very unimportant.

Plain Work in Beds and Joints is taken to stones laid upon or against other blocks of stone; otherwise, as I have just observed, they would be taken as half-sawing. Take as an example the case of a stone quoin to a brick building, the beds of which would be taken as plain work in beds, the stones being laid one on another, whilst no joints would be measured, the ends being simply measured as half-sawing. Should, however, the quoins be set against stonework, as in the case of stone building, the joints would have to be measured similarly to the beds of the stone, and abstracted with that item as shown in the Table. Some surveyors measure only one plain bed and one plain joint to each stone, with certain exceptions (piers, pilasters, columns, &c.), but I think it a much better plan to measure the whole of them, and state in the bill that this has been done. Where the work, however, is continuous, it is customary to allow for joints to every 3 feet of stone only.

Plain face is taken to all external faces of the stonework which are not otherwise worked. It is also taken to the faces of stones, where it is necessary to be executed for the purposes of setting out other work. In cases of elaborate detail this is frequently the case, and also in tracery.

Sunk work is taken where it occurs; and must be described as it is executed, whether rough sunk, sunk work in beds and joints, sunk work in rebates, in weatherings, &c.; and if circular it must be taken separately. Measure the whole of the surface of the sinking, that is, take the girth. In the case of a rebate, as Fig. 12, the dimension for the width would be 6 inches, and the ends (if any) would be numbered. No deductions would be taken to any joints which might occur, and the plain faces to top and side would be measured the full width and height of the stone, the rebate being executed afterwards. This description of work is further explained in the examples to be hereafter given.

FIG. 12.



Moulded work is measured by the foot superficial, taking the length by the girth, care being taken to add for all returns to the length. Girth the work for the width, but simply the moulding, the weathering being taken as sunk work and not moulded—the moulded being of greater value.

Grooves, throats, rebates under 3-inch girth, chamfers, splays under 3 inches wide, reeds, flutings, joggle joints, cutting and pinning to landings, &c. &c., are measured by the foot *run*.

Number *chimney-pieces*, giving full description of workmanship and material, though many surveyors prefer to measure *plain chimney*-pieces by the foot superficial, taking labours to *edges, and* numbering rounded corners. If numbered, state the *prime cost* value, exclusive of the fixing.

Paving, Landings, &c., would be measured as described to York stone.

Numbers.—Enumerate all mortises for door posts, balusters, iron railings, cramps, plugs, and dowels; also all cutting and pinning to ends of steps, notchings, letting in coal plates and air gratings, sink-stones, sinks, pipe holes. Also all mitres, stating whether internal or external, and giving the girth of the mouldings, &c., to which they refer; stops, whether to mouldings, chamfers, &c., stating size and whether square, splayed, moulded, or as the case may be. Also number any items for carving, &c., as shown in the accompanying Table. In taking cramps and plugs, state the sizes and the metal, which should be reduced to weight; the labour of letting in and running with lead should be taken separately.

Carving.—Measure strings, parapets, or where the work is continuous, by the foot run. Number all single items. I have given examples of different descriptions of carving in Table V.

In conclusion, I would observe that if I have omitted describing any particular class of work, I believe the reader will be able, from the general remarks which I have made, to apply the rules laid down to each individual case; but at the same time I have thought it advisable to give a few general examples for the reasons already stated.

In prefacing Table V., I would observe that therein I have laid before my readers briefly the various descriptions which customarily come under the notice of the quantity surveyor, but of course there will be many others, every job varying in some particular; but I think sufficient has been given to illustrate the principle of the measurement of stonework.

TABLE V.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

LOCAL STONE WALLING.

Rubble stone in walling in random courses in foundations, well bonded and well flushed with mortar and grouted with hot lime and sand every three courses—average 2 ft. thick	At per yard super.
Ditto *above foundations*. average 18 in. thick, ditto, *ditto*	„

Extra to rough hammer-dressed arches 16 in. high, with radiating joints	At per foot run.
Ditto labour to external quoins	"
Ditto internal ditto	"
Ditto to forming openings for air gratings (12 × 6) in 18-in. wall	At per number.

YORKSHIRE STONE.

Tooled paving, laid in regular courses, and bedded and jointed in cement	At per foot super.
Ditto shelves	"
Rubbed hearths	"
Tooled one side landings	"
Rubbed one side landings, tooled the other side	"
Tooled steps and risers to specified sizes, including tooled edges	At per foot run.
Solid rubbed steps	"
Feather-edge tooled coping, set in mortar and throated, including all joints	"
Weathered and throated rubbed window sills	"
Rubbed curb	"
Cutting and pinning to 3-in. landing in cement	"
Labour to back joint	"
Ditto to fair edge to 4-in. landing	"
Ditto circular ditto ditto	"
Joggle joint and cement to 4-in. landings	"
Tooled templates and setting in cement	At per number.
Ditto corbels for plates pinned in cement	"
5-hole dished sink-stone	"
Tooled and dished sinks, with rounded corner, and hole cut and rebated for bell trap	"
Ends to steps cut and pinned	"
Fair ends to steps	"
Quadrant ditto	"
Extra to corner stones in coping	"
Mortise holes	"
Ditto and lead	"
Rebated holes for coal plate	"
Double notches in hearths	"
Plain joints and lead plugs to steps	"
Caulking holes and lead for gratings	"

PORTLAND, BATH, AND ALL BUILDING STONES.

Portland stone, including hoisting and setting	At per foot cube.
Ditto ditto above 40 ft. from ground	"
Sawing	At per foot super.
Plain work in beds and joints (all faces measured)	"
Circular ditto	"
Plain face	"
Circular ditto	"
Rough sunk work	"
k work in beds and joints	"
in arch stones	"

Sunk work in rebates for frames	At per foot super.
Ditto rubbed	"
Ditto ditto circular	"
Circular face to shafts of small columns	"
Circular circular plain face	"
Moulded work in cornices, &c.	"
Circular ditto	"
Ditto ditto in small caps and bases	"
Circular circular ditto	"
Portland stone ashlar, average 6 in. thick, including bonders, joints, and faces	"
Groove for iron tongue	At per foot run.
Ditto for iron frame to revolving shutters	"
Ditto for lead flashing and burning in	"
Sunk splay, 1 in. wide	"
Ditto rebate, 3 in. girth	"
Stop chamfer, 2 in. wide	"
Mouldings under 6 in. girth	"
Stopped ends to sinkings	At per number.
External mitres	"
Internal mitres	"
Splayed stoppings to 2-in. chamfers	"
Moulded ditto ditto	"
Mitres ditto ditto	"
Stopped ends to moulding 9 in. girth	"
External mitres ditto	"
Internal mitres ditto	"
Intersecting mitres ditto	"
Returned, mitred, and stopped ends to ditto	"
Housings for ends of steps 14 in. × 16 in.	"
Fair sinkings, 2 in. wide, 3 in. high, and 2 in. deep, to form dentils	"
Ditto 2 in. × 6 in. × 4 in. deep, to form small moulded trusses in cornice	"
Chimney-pieces, with full description or p. c. price	"
Setting to chimney-pieces	"

LABOUR: *working and carving, including boasting, for ditto.*

Scroll ornaments in panels, 18 in. × 9 in. extreme size, as sketch	At per number.
Quatrefoil sinkings, 8 in. × 8 in. and 1½ in. deep, as sketch	"
Head to keystone, 12 in. × 9 in. on face, as sketch	"
Truss 12 in. face, 9 in. profile, and 2 ft. high, as sketch	"
Terminal 3 ft. high, and 2 ft. 6 in. wide, as sketch	"
Caps to cols. 6 in. diam. at necking, and 12 in. high, in bold relief, including moulded abacus and necking	"
Ditto to ¾ columns, and ditto ditto	"
Ditto to pilasters, 18 in. wide at necking and 9 in. high with two 10-in. returns, in bold relief	"
Carved boss terminations, 5 in. × 5 in. to moulded string	"
Ditto 4 in. diameter on face of moulded string	"

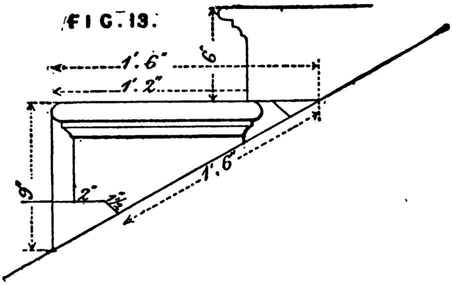
Enrichment, 9 in. high in cornice, in bold relief, as sketch	At per foot run.
Mitred angles to ditto	At per number.
Stopped ends ditto	„
Perforated ornamental parapet, 10 in. high, through 6 in. stone	At per foot run.

EXAMPLES OF MEASURING STONEWORK.

I now give a few illustrations, the better to exemplify the instructions given.

SPANDREL STEPS.

FIG. 13.



There are several methods of measuring spandrel steps, but I think that in most general use is to take them as follows:—Measure from out to out for the length, including the portion pinned into the wall; for the breadth, take from the edge of the nosing to the acute angle; and for the height, take the dimension from top of step to angle. This divided by 2 will give the cubical contents of one step. I have shown the extreme dimensions of the stone by dotted lines. Spandrel steps are measured in this way, as two steps can be cut out of a rectangular block of the dimensions given.

½ 5·0
1·6
9 Portland stone step.

½ 1·6
9 Half-sawing to one end.

1·2
2
1·4

5·0
1·4 Plain face to top.

5·0
1·6 Add soffit.

·6
·6 Add front of step pinned into wall.

2
1½
1½
5

5·0
5 Sunk work in rebate.

4·6
6 Add to front (stopped).

1·2
4 Add end.

4·6
1·4
5·10

5·10
6 Moulded work.

No. 1 mitre to 6-in. moulding.
No. 1 stopped-end ditto.
No. 1 mitred and returned end ditto.
No. 1 step cut and pinned to wall.
No. 2 mortises for balusters.

Should the moulding not be returned to step, the end would be taken as plain face. The soffit of spandrel winders would be measured as circular plain work.

WINDOW SILL.—FIG. 14.

4·0
1·0
4 Portland stone sill.
4·0

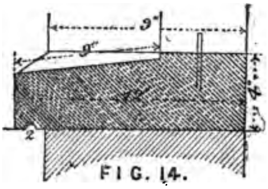


FIG. 14.

1·0
4
1·4

1·4 Half-sawing.

---

2 1·0
4 Add ends.

4
4
2
—
10

1·0
10 Plain face.

---

2 4
2 Add ends.

4·0
9 Plain face sunk in weathering.

No. 2.—Stops to weathering.

4·0 Groove for tongue.

4·0 Throat.

Arch Stone.—Fig. 15.

1·2
9
1·6 Portland stone.

1·2
1·6 Half-sawing to back.

9
1·6 Plain work in one joint.

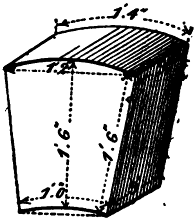
9
1·6 Plain work, sunk ditto.

1·4
9 Circular plain work in bed.

1·2
1·6 Plain face.

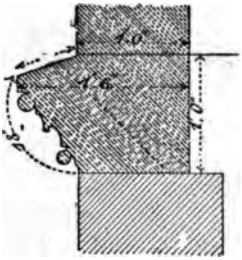
1·0
9 Circular ditto.

FIG. 15.



Cornice.—Fig. 16.

FIG. 16.



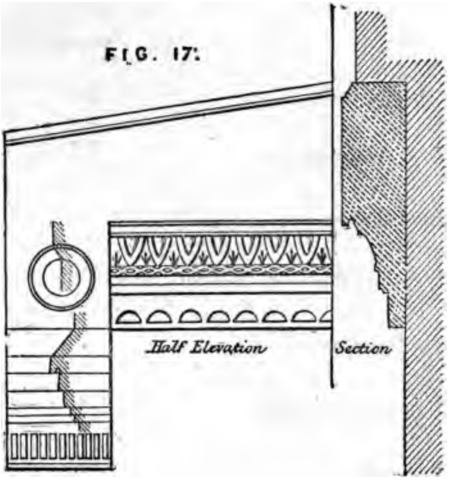
	3·0 1·6 1·0	Portland stone cornice.
	3·0 1·0	Half-sawing bottom.
	3·0 1·0	Bed-top.
2	1·6 1·0	Joints.
	3·0 1·0	Plain face-back.
	3·0 7	Do. sunk in weathering.
	3·0 1·6	Moulded work.

Head to Window.—Fig. 17.

	7. 6 2·10 9	Portland stone.
	7· 6 2·10	Half-sawing (back).
2	2·10 9	Add ends.
2	1· 2 9	Plain work in beds.
2	3·10 9	Sunk work (top).
	7· 6 2· 6	Plain face (average).
	5· 0 6	Add.
	5· 0 9	Moulded work.
	3·10 4	2 Stops. Add moulding top.

		1 Mitre.
	5· 0 6	Egg and tongue carving.
	5· 0	Enriched bead ditto, 3 in. girth.
		2 Circular moulded and sunk panels, 1 ft. 4 in. diameter.
		15 Small semicircular splayed sinkings as sketch.

FIG. 17.



2	1·2 1·7 1·2	Add stone truss.
2	1·2 1·7	Half-sawing back.
2	1·7 1·2	Add one end.
2	1·2 1·2	Add bottom
2	1·2 1·2	Plain bed.
2	1·7 1·2	Plain face (one end).

2	1·2 6	Add (face).
2	1·2 6	Sunk work in weathering.
2	1·2 3	Add in rebates.
2	1·2 1·3	Moulded face.
	2	Narrow circular sinkings, 4 in. high, with circular stops.

Before concluding the trade, I have thought it advisable to contrast the English custom of measuring with that of the Scotch, and for this purpose I have had forwarded to me the "Rules and Regulations for the Measurement of Mason Work in Edinburgh, Leith, and vicinity, as agreed upon by the Architects, Surveyors, and Builders" of those neighbourhoods. The perusal of this pamphlet has given me much pleasure, and I regret that some such system as this has not been adopted in the metropolis. Rules for the guidance of all concerned could easily be drawn up at a few meetings of the leading members of the profession and the building-trade, which would dispense with many controversies as to the measurement of certain trades which exist to so large an extent at the present time. My desire in the present work has been to lay down a basis of action, but I should infinitely prefer such a meeting as that I have just mentioned as one that would meet more with the approval of the profession as a body.

The annexed form I give for my Scottish readers who are interested in the subject, and who may not be possessed of the pamphlet to which I have made allusion, and also for those of my English readers who may have business with our neighbours "over the border." I have only mentioned therein items as to which there is a difference of measurement. As will be observed, I have made no remark on local rubble-stone, the measurement of which is also spoken of in the pamphlet, as it must necessarily differ in many respects from the rules which I have laid down, it being so entirely dependent upon custom, even in our own country—as it differs in many counties.

Table VI.

DESCRIPTION.	METHOD OF MEASUREMENT.	
	Scotch.	English.
Brickwork.		
Brickwork in partitions, gables, and party walls.	At per yard super, deducting only for press voids, but not for fire-places, vents, or window bossings	At per rod of 272 ft. super of 1½ brick thick; the brickwork, where above ½ brick thick being reduced to this standard. Half-brick partitions at per foot super. All openings are deducted, including the fire-places, but not the flues, the extra labour in forming them being taken as an equivalent for the saving in brickwork.
Ditto circular on plan, or in arches and inverts.	Ditto, taking the largest size.	Ditto, taking the mean circumference.
Plumbing corners of external walls.	At per foot lineal.	Not measured.
Reveals of outside doors and windows.	At per foot lineal for extra labour.	Not measured in common brickwork. Measured in superior facings with the front.
Superior bricks for face work, point-pointing, and flushing for white-washing.	At per yard super.	At per foot super.
Hewn Work.		
All hewn work, except stair-steps, plats, hearths, and pavements.	Charged for its additional value over price of rubble-building measured on exposed surface, and classed and rated separately, according to size of materials and kind of work.	Stone and labour measured separately, the stone being taken in one item, and the labours classified according to the execution.
Base courses, strings, belts, plinths, narrow copings, and blocking courses.	At per foot lineal, specifying breadth, thickness, and workmanship.	As above. Exception made with regard to Yorkshire stone, which is customarily measured according to Scotch method.
Sills, lintels, upstarts, architraves, and mullions.	Ditto, ditto.	Ditto, ditto.

DESCRIPTION.	METHOD OF MEASUREMENT.	
HEWNWORK.	SCOTCH.	ENGLISH.
Rebates and corners	At per rising foot, specifying size of stone and description of labour, and where part moulded, the girth of the plain work on the face, and to bottom of check of the ingoing to be stated, as well as the net girth of the moulding.	At per foot cube, labours separately.
Plain ashlar	At per foot super, allowing 3 in. for wall-hold at internal angles; 6 in. allowed for bevelled cuttings as at "pediments, skews, &c."	At per foot super, measuring the face and making no additions; cuttings taken at what they measure for labour, no allowance being made to the stone beyond what it measures.
Deductions for doors and windows in ashlar, with upstarts and pilasters of stone.	Full deduction of void and piers to be made less 1 ft. in width, which is understood as an "allowance for headers at ingoing in ashlar work. The price of ashlar to include for headers in general surface."	Full size of opening deducted.
Ordinary cornices and other running mouldings.	Measured from extreme points at per lineal foot, the extreme lengths of returns at external and internal angles being taken as an allowance for mitres.	Stone and labours measured as before stated, and the mitres numbered, stating the girth of the moulding.
Special cornices, where there are numerous returns and coping to chimney stalks (when broad stones are ordered).	At per foot super, and labour to edge at per foot run, stating girth and description of work.	Ditto, York stone, measured as before described.
Steps	Numbered.	At per foot cube, labour being taken as before; York stone at per foot run.
Paving	At per foot super, making an allowance of 3 in. for every lineal foot of cutting at angles or circles.	At per foot super; no allowance made in stone for cutting; labour to cutting being taken separately at per foot run.

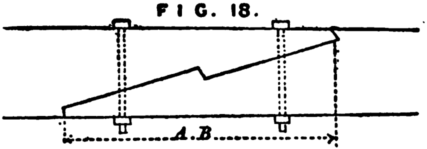
CHAPTER VI.

CARPENTER.

DIFFERENCE BETWEEN CARPENTERS' AND JOINERS' WORK—ALLOWANCE FOR SHRINKAGE—DISSECTION OF WORK—EXAMPLE OF—OPEN ROOF—LABOUR TO JOINERS' WORK, HOW TAKEN—FRAMED TIMBERS—FIXING—FLOORS—BOND TIMBER—QUARTER PARTITIONS—JOISTS—DOUBLE-FRAMED FLOORS—HERRINGBONE STRUTTING—DEDUCTIONS FROM FLOORS—SPRINGER FOR TRIMMER ARCHES—GIRDERS—OAK TRUSSES—BOND TIMBER—EXAMPLE OF—PLATES AND LINTELS—ROOFS, TRUSSES TO—KING POST TO—EXAMPLE OF—RIDGES AND HIPS—HIPS AND VALLEYS—CLEATS—COLLARS, &C.—CUTTINGS TO RAFTERS—IRONWORK TO—BOARDING OR BATTENING—EAVES BOARDING—TILTING FILLETS—DEDUCTIONS FROM ROOFING—ADDITIONS TO—GUTTER BOARDS AND BEARERS—EXAMPLE OF—DRIPS AND CESSPOOLS TO—TRAP-DOORS—LININGS TO—RIM TO—FASTENINGS TO—CEILING JOISTS—ROUGH BOARDING—GUTTERS TO FLATS—FIRRINGS TO FLATS—ROLLS FOR LEAD—BOARDING—BATTENING TO WALLS—SOUND BOARDING—EXAMPLE OF—WEATHER BOARDING—ARRIS GUTTERING—QUARTER PARTITIONS—OAK TEMPLATES—OAK CURBS—BRACKETING TO CORNICES—EXAMPLE OF—CRADLING—ANGLE BRACKETS—ANGLE STAVES—CENTERING—TO VAULTS—TO TRIMMERS—TO WINDOWS—TURNING PIECES—HOW TO MEASURE—LABOURS TO CARPENTERS' WORK—CIRCULAR TIMBERS—TABLE OF WORK.

IN measuring carpenter and joiners' work, greater care is required than with the trades already treated of, and the student must have a tolerable amount of practical knowledge of the different methods of framing timbers and joiners' work before he will be able successfully to undertake its admeasurement, particularly when taking off from the working drawings. The one great difference in the measurement of the works of the carpenter and joiner is this:—That in the former you measure the extreme length of the timbers, including the tenons; whilst in the latter this is not the case, the net superficial quantity only being measured, the tenons being considered in the price. In scarfings and laps to timbers, the length of the scarf or lap would have to be added to the net length of the timber, and where the ends of the timbers are bevelled take the *full* length (see Fig. 18).

FIG. 18.



Make no allowance for shrinkage of timbers, but take the net scantlings. Where it is stated in the specification that the timbers are to bear the full scantlings when fixed, some surveyors make an addition to the material to cover the shrinkage. This is unadvisable, as the timber is presumed to be dry when fixed, in which case no allowance is necessary. Wherever an allowance is made, however, as it is difficult to get surveyors to give up their own adopted methods of measuring, it would be advisable to make a separate item of it, and describe it as an allowance to meet the shrinkage of timbers.

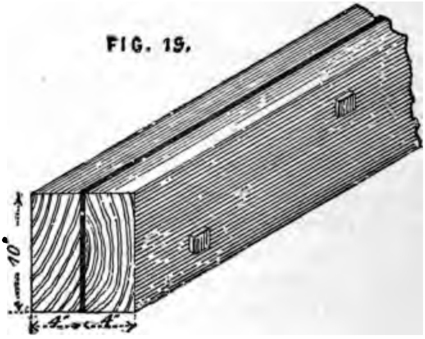
Dissect the work as much as possible, classifying it according to the nature of its execution, and describe briefly but fully the nature of the labour on the same. Where there is any labour executed on the material in carpenters' work: for example, to the timbers of an open Gothic roof, as planing, chamfering, &c., such labours would have to be taken out separately from the material and described as labour in planing to fir, oak, or as the case may be, or again, so many feet run of chamfer. In joiners' work the labour is generally described with the quantity, thus forming only one item instead of two or three, or even more, as is so frequently the case in the carpenter.

Where the timbers are *framed*, that is mortised and tenoned, they must be kept separate from the works that are only fixed, such framing necessarily entailing an additional amount of labour. In quantities, all works are understood to be *fixed*, unless stated to the contrary, and would include the labour in nailing, laps, dovetails, &c.

Floors.—Commence measuring at the bottom of the house, taking first the sleepers, then the wall plates and ground joists; afterwards take the bond timbers (if any), lintels, and wood bricks, to the lowest story, and lastly the quarter partitions. Having finished one floor in this way, proceed to the next, but always complete the one floor before commencing the second; otherwise, omissions are apt to take place which, by adopting this rule, are easily avoided. Proceeding then with what are termed *Naked Floors* (the flooring boards being taken with the joiner), take firstly, the sleepers and ground joists, the length by the scantlings. These must be taken separately from the joists of the other floors, and made a separate item of in the abstract and bill, they not entailing so great an amount of labour as the latter, consequently they will not bear so great a value. All other joists are measured in a similar manner, taking care in each case to include the portions inserted in the walls.

In double-framed floors it is customary to take the timbers bearing the greatest scantlings first. Where framed, as in girders, binders, trimmers, &c., they must be kept separate and so described.

FIG. 19.



Herring-bone and other strutting between the joists is measured at per foot run, stating the scantling and the description, no deduction being made for the intervening joists.

Make the necessary deductions for fire-places, staircases, &c.,

as they occur, and add for the additional width of the trimmers in each case.

Measure the feather-edge springer for trimmer arch of fireplace at per foot run, taking the length of the arch.

Girders sawn, reversed, and bolted, must be kept separate from the ordinary fir girder, on account of the additional labour thereon; and, again, greater labour still will be required where an iron flitch is inserted to fit the bolts, &c. The accompanying figure (No. 19) I give to assist the reader, and the better to exemplify my meaning. In the latter case the iron flitch is not measured in with the timber, the net amount of stuff only being taken.* Trussed girders must also be made a separate item of.

Oak trusses let into girders are measured by the foot run, and the labour, letting in screw bolts, fixing plates, straps, &c., are numbered; the ironwork being taken off at the same time, and afterwards abstracted and billed with the Smith.

Bond timber is now seldom used, being superseded by hoop iron, which is a great advance on the old system of building; the unsound uses of the old method in this particular are apparent. Where bond timber is adopted, it is measured the length by the scantling, adding for the laps and dovetails, and is described in the bill as bond timbers. As they are, or should be, carried through the openings in the walls, and have afterwards to be sawn off to the size of the opening, it is customary to make a deduction equal to half the width of the opening only, in order to allow for the extra labour in the sawing and waste.

Plates and lintels are also generally taken and described as bond timber, about the same amount and quality of labour being expended upon them. They are similarly measured. Many surveyors include the wood bricks for fixing joiners' work under the same heading, though, I think, incorrectly, the extra amount of labour in sawing the timber to the small sizes required and bedding same entailing an additional cost. I prefer, therefore,

---

* Thus presuming the length to be 16 ft., the timber would be measured thus:

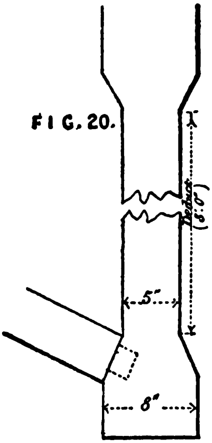
2	16·0		
	10		Fir bolted in flitch girder.
	4	8·10	

in this case to advise the rule adopted by the other branch of the profession—viz. to number them and state the sizes.

Roofs.—Where trussed, take the truss first. All timbers comprising the truss—as tie beams, king post, principal rafters, and struts—must be kept distinct from the other portions of the roof, and described as "fir framed in trusses," in each case take the extreme length of each of the timbers, including all the tenons as before stated. If the tie beam is scarfed, add the additional length of timber required for this purpose to the net length of the beam as in Fig. 18.

For the king post (see Fig. 20) the width must be taken where it is greatest, namely, below the shoulders, and a deduction made on one side only between the shoulders, the other side being allowed to pay for the cost of sawing and waste. After the truss take the purlins, which are measured as above. Then take the common rafters, dragging pieces, &c., and lastly, the ridge, hips, and valley-pieces, all to be reduced to the foot cube—this being the more uniform plan, though some surveyors take the last three items as a superficial dimension, and state the thickness in each case. At the same time as measuring the ridge and hips, take the ridge and hip rolls, when there are any, at per foot run, stating the diameter, and also state if spiked or otherwise.

FIG. 20.



Take a running dimension of the hips and valleys to allow for labour and waste in cutting, and describe it as "cutting and waste."

The cleats to purlins are usually numbered.

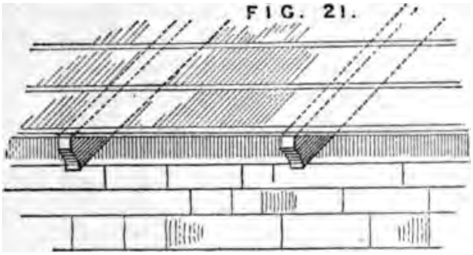
Collars, curbs, pole plates, &c., are measured as "fir framed in roofs."

Take the cuttings to end of rafters where visible at per number according to nature, giving sketch where necessary. (See Fig. 21, where one kind of end is shown.)

Measure the ironwork as it occurs, number the labour for fixing the same, and afterwards bill the ironwork with the Smith.

Boarding or battening for slate is measured the length by the breadth, from the extreme edge of the rafter up to the ridge, and reduced to the square of 100 feet superficial, stating the thickness, as shown in the Table. In the case of battens it will also be necessary to state the distance between each batten, and its width.

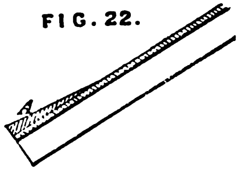
FIG. 21.



Eaves boarding is measured by the foot run, and the width and thickness described.

Tilting fillets (shown in Fig. 22, and marked A) are also measured by the foot run, and the thickness stated.

FIG. 22.

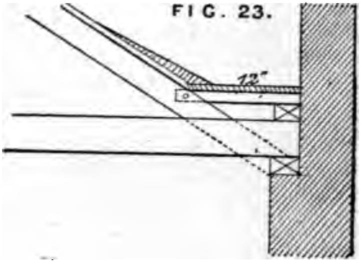


It is advisable in the two foregoing items to collect the whole of the dimensions on each roof, on waste, so that one dimension only need to be brought forward.

Make all the deductions where they occur for trap-doors, skylights, and chimney shafts, and at the same time make the addition for the trimmers, &c., not forgetting to include the tenons in the length.

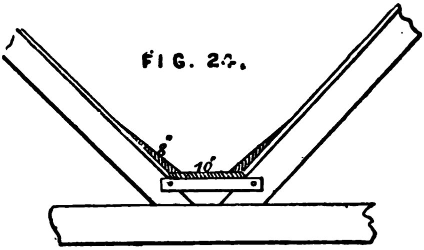
Gutter boards and bearers (shown in Figs. 23 and 24) are measured by the foot superficial, taking the extreme length by the average width; but it is as well to state the greater and smaller widths, and show how you obtain the mean or average width on "Waste." State the thickness of the boarding. It is advisable also to state the sizes and particulars of the bearers when given in the specification; but this is so seldom done that surveyors, as a rule, do not specify them separately.

FIG. 23.



Where the bearers are specified to be framed, they must be described as such in the bill thus, "1-inch deal gutter boards and framed bearers."

FIG. 24.



Number the drips and cesspools, describing the latter as "extra to forming cesspool."

The following is the way these items usually appear in the Dimension-book:—

Greatest width of gutter .. .. 2·0
Smallest „ .. .. 1·0
2)3·0
Average .. .. 1·6

30·0 1·6	45·0	Inch deal gutter board and bearers.
		No. 3 Rebated drips. „ 1 extra to forming cesspool.

It is perhaps better, before taking the gutter bearing, &c., to take the trap-doors and linings where these occur. In so doing state the description of the linings, and in measuring them add to the length in the clear the thickness of the material for the framings. Collect the whole lengths of linings of each opening on waste, so as to have but one dimension for each, and they would have to be described thus:—"1¼-inch deal wrought and splayed linings dovetailed at angles," or as the case may be. The rim would be taken at per foot run, and in describing same give the width and thickness, and state also whether dovetailed at angles.

For the trap-door take the width by the height, and state the thickness, and give the full description. Number the handles, bolts, and all fastenings appertaining thereto.

In measuring ceiling joists, take the length by the scantling, the same as stated for floor joists, making the deductions for chimney breast, &c., where they occur, and adding for trimmers as described for roof.

Rough boarding to flats, &c., is measured the length by the breadth, and valued at per square, as shown in the Table. It will be necessary to state the thickness and quality of the material, with description, stating how laid, whether the edges of the boards are "shot," or otherwise. Where any cutting is required, as to splays, irregular walls, &c., take a running dimension of the length, and describe it as "extra to cutting and waste." Where a gutter is formed in the flat, it is measured at per foot run, and described as "extra to forming gutter in flat"; also, number the cesspools as extra, as before described to other gutters.

Firrings to flats, &c., are measured superficially, taking the area of the flat as shown in the Table.

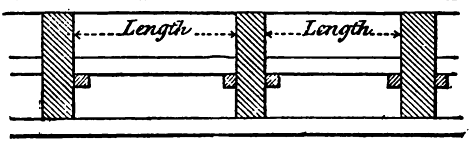
Rolls for lead are measured as shown in the Table, stating the diameter of the roll. Short rolls in gutters are generally numbered.

Boarding, where laid against walls or to ceilings, must be kept separate from that laid flat, more labour being entailed when upright or against ceilings, than when laid flat.

Battening to walls is measured superficially, the length by the height. State the thickness of the material and the method of securing to the wall, whether plugged or otherwise, according to the nature of the backings.

To measure *sound-boarding*, take the length by the width of the space between two joists, and multiply this dimension by the number of such spaces in the room where such sound-boarding is required to go. It will also be necessary to describe the fillets which are included in this one item, and to state whether they are single or double. It is wrong to measure sound-boarding as some surveyors do, viz. by taking the entire area of the room, and making no deduction for the joists, as before stated. Whenever it is done in this way, as it is difficult to get a surveyor to alter his adopted methods of measuring, it should also be stated that the timbers have been measured in. The Fig. 25 illustrates this item.

FIG. 25.



Weather boarding is measured similarly to rough boarding, stating whether edges rough, splayed, wrought, or wrought and beaded, &c., the net area of the surface only being taken.

Arris guttering is generally measured by the foot superficial, and water tanks by the foot lineal.

Quarter partitions are measured by the foot cube, taking first the lengths of the several timbers, and then stating the scantlings. Take the timbers of the largest scantlings first, as the head and sill, including the portions let into walls, then the door-posts and head, the braces, and lastly the quarters, taking care to make the deductions for doorways where they occur. The cubes are then added together, and the sum of the whole is brought into the abstract in one item, and billed as "fir framed in partitions." Where the partition is trussed, it must be described as "fir framed in trussed partitions." The student must not forget, as previously stated, to include in both cases the tenons, and care must be taken not to omit any ironwork in connection with the partitions, as bolts, &c., which should be taken out at same time, and afterwards billed with the Smith.

Oak templates are generally numbered, stating the dimensions each way.

Oak curbs are also measured by the foot cube; take the length by the scantling and add for the laps.

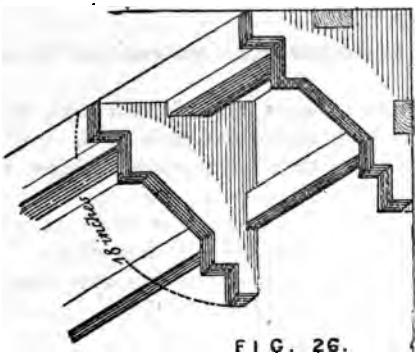


FIG. 26.

In measuring *bracketing to cornices*, &c., take the length by the girth of the moulding, making a superficial dimension, and specify the thickness of the deal used, and how secured to the wall. To obtain the proper length, it will be necessary to make a deduction on the length of each wall of the width of the projection of the bracket, which will give the average; or the better way would be to deduct four times the width of the projection from the collected lengths of the walls of a rectangular room. For a sketch of ordinary bracketing, see Fig. 26. If to circular ceiling, state so, and do not measure it twice, as some surveyors do, and call it all "straight."

Cradling for entablatures is taken in a similar manner—according to the thickness of the material.

All angle brackets are taken with the others, and afterwards billed again as *extra* only to angle brackets.

Angle staves are measured by the foot lineal, taking the net length.

Centering—to vaults, groins, &c. Take the length by the girth or circumference of the under side of the arch, which will give a superficial dimension. This is brought into the square of 100 feet, as stated in the Table, and is valued as such for use and waste. It is customary to measure centering to all vaults, although many of them may be of the same size, and the centering of one does for some of the others, in which the additional time in removing it for the other arches might be made an "extra" of.

Centerings to trimmer arches are measured the length by the girth.

The centres to windows it is advisable also to measure by the foot surperficial, taking the girth by the width of reveal, and stating the nature of the curve, whether semicircular, pointed, &c.

Turning pieces to flat arches are taken at per foot run, stating the width of reveal, and including struts.

No centering is taken to the arches over fire-places where chimney bars are provided (they not being necessary). Where there is no chimney bar, they must of course be provided.

There is a difference of opinion as to the measurement of centering to arches of windows, relieving arches, &c., some preferring to take them at per number, and average the openings, keeping the different widths of soffit separate; so having one item for the 4½ inches, another for the 9 inches, and so on—but, of course, keeping at the same time the different arches separate, thus, the semicircular from the Gothic, pointed, &c.; but I think it better to follow the course I have laid down, and measure all by the foot superficial.

Labours.—All labours, on whatever class of work in connection with the carpenter, should invariably be measured at the same time as the material, otherwise it will be almost impossible to prevent inaccuracies occurring, and it will save a considerable amount of time. The labour on carpenters' work is generally confined to planing, splays, chamfers, rebates, &c., the sawing of timbers being of course always understood to be included in the price. Planing fir is measured by the foot superficial, also the ··our to splays when over 6 inches wide. Chamfering is measured by the foot run, and the stops numbered according to the description, whether straight, splayed, moulded, &c., although this is more within the province of the joiner than the carpenter. Rebates, beading, &c., are also measured by the lineal foot.

It may perhaps be as well to observe, in concluding the Carpenter, that circular timbers are generally measured at per foot run, stating the scantlings, and if any labour is executed on the same, it is as well to include it in the item, and not keep it separate from the material, as stated for straight work, as the labour being circular, it is better kept with the material, the builder being better able to form an estimate of its cost when knowing what it is for. Otherwise it would have to be abstracted separately, and described as to circular work. All additional lengths for scarfing, &c., must be added as before. It will be also necessary to state the radius. An example of a circular rib to a Gothic roof will be found in the Table annexed. Number the framed and mitred angles where they occur, and also the intersections, stating sizes in each case as shown. When the curve is other than circular it must be so stated.

TABLE VII.

This Table has a double use ; it shows the order of taking this Trade, and the method of Measurement.

Fir in plates, lintels	At per foot cube.
Ditto in ground joists and sleepers	„
Ditto in girders	„
Ditto ditto sawn, reversed, and bolted	„
Ditto fitted and bolted to iron flitches	„
Ditto framed in roofs	„
Ditto ditto in floors	„
Ditto ditto in quarter partitions	„
Ditto ditto in trusses	„
Oak in templates	„
Ditto in curbs	„
Centering to vaults and arches	At per square of 100 ft. super.
Ditto to trimmers	At per foot super.
Ditto to segmental arches	„
Ditto to semicircular arches	„
Ditto to Gothic pointed arch	„
Ditto ditto with splayed soffits	„
¾-in. battening, 2½ in. wide, for countess slating	At per square of 100 ft. super.

¾-in. rough eaves board	At per foot super.
Ditto ditto boarding jointed for slates	At per square of 100 ft. super.
Ditto ditto boarding edges, shot, and firrings for flat	„
Ditto ditto valley boards	At per foot super.
Ditto ditto sound-boarding, with single fillets	At per square of 100 ft. super.
Ditto ditto with double fillets	„
Labour planing to fir	„
Inch rough boarding	„
Ditto ditto bracketing for soffit	At per foot super.
Ditto ditto gutter boards and bearers	„
Ditto ditto weather-boarding, with splayed edges	At per square of 100 ft. super.
Ditto wrought ditto	„
Ditto ditto one side and V-jointed batten boarding plugged to walls	„
Inch deal matched and beaded boarding to ceiling	„
Ditto deal wrought and ledged trap-door	At per foot super.
1¼ ditto ditto and splayed linings dovetailed at angles	„
Splayed cutting and waste to ¾-in. boarding	At per foot run.
Tilting pieces	„
Springing piece to trimmer	„
Labour to rebates	„
Ditto to chamfer	„
Turning pieces to arches 4½ soffit	„
Stout rough fillets nailed to girders	„
2 deal rounded roll for lead	„
Herring-bone strutting	„
1½ in. × 9 in. cut and stopped chamfered barge board	„
10 in. × 4 in. circular wrought ribs to ceiling screwed up in two thicknesses, framed and chamfered on 2 edges	„
Fir cleats to purlins	At per number.
Wood-bricks (giving sizes)	„
Rebated drips in gutter	„
Extra to dovetailed cesspools in gutter	„
Oak templates 2 ft. × 9 in. × 6 in.	„
Mitred intersections of circular ribs, 10 in. × 4 in.	„
Framed and mitred angles to 6-in. ribs	„
Fixing screw bolts to flitches—*extra to*	„
Ditto to principals	„
Ditto straps with 2 bolts each	„
Ditto king heads to trusses	„
Ditto shoes to feet of principals	„

I have thought it easier to keep this trade separate from the Joiner, although in a small job this is not always done.

CHAPTER VII.

JOINER AND IRONMONGER.

DISTINCTION BETWEEN CARPENTER AND JOINER—DIFFERENCE OF MEASUREMENT—ORDER OF PROCEDURE—FLOORS—DEDUCTIONS FROM—BORDERS TO HEARTHS—SINKINGS FOR MATS—IRREGULAR-SHAPED ROOM—SCRIBING TO WALLS—SKIRTINGS—GROUNDS TO—ANGLE, &C.—MOULDING PLANE—SASHES AND CASED FRAMES—EXAMPLE OF—SASH FASTENINGS—CIRCULAR SASHES—FIXED SASHES—FRENCH CASEMENTS—CIRCULAR HEADS TO—WINDOW LININGS'—WINDOW BOARDS—SPLAYED LININGS—FRAMED GROUNDS—EXAMPLE OF—ARCHITRAVES—WINDOW BACKS—EXAMPLE OF—CAPPING TO—ELBOWS—BOXING SHUTTERS—BACK FLAPS—BACK LININGS—SHUTTER BOXINGS—SLIDING SHUTTERS—DOORS—LEDGED—WITH GOTHIC HEADS—SASH—EXAMPLE OF—CLASSING DOORS—DOOR FRAMES—EXAMPLE OF—OAK SILLS—JAMB LININGS—EXAMPLE OF—FRAMED DOOR GROUNDS—EXAMPLE OF—ARCHITRAVES—DADOS—PLINTH TO—PILASTERS—COLUMNS—CARVING—FRAMED PARTITIONS—DOORS IN—CUPBOARD FRONTS—SPANDREL FRAMING—SHOP FRONTS—FASCIATE—BRACKETING FOR CORNICE—PUTTY COMPOSITION—SHOP SHUTTERS—REVOLVING SHUTTERS—WORK TO—STAIRCASES—EXAMPLE OF—EXAMPLE OF HOUSING—STRINGS—LININGS TO WELL HOLES—HANDRAIL—IRON CORE—NEWELS—IRON NEWELS—BALUSTERS—ORNAMENTAL IRON BALUSTERS—CLOSET FITTINGS—KITCHEN DRESSER—SINKS—ORDER OF TAKING LABOUR—OAK OR MAHOGANY—FRENCH POLISHING—IRONMONGERY—TABLE OF WORK.

HAVING completed the Carpenter, I proceed now to treat of the Joiner, with which is usually incorporated the Ironmonger. I have thought it advisable to keep the Carpenter and Joiner apart from each other, so as to make the subject less complicated than it otherwise would be. The great distinction between the two trades is, that whereas the former is engaged on what is commonly termed the carcase of the building, the other is employed on the internal fittings and finishings. In the one case the labour would be ordinarily small in comparison with the material, whereas in the latter the reverse is the case, and the labour consequently requires more minute description than in the Carpenter. I have already stated the difference of measurement between them, and I would repeat that in the Joiner the net superficial quantity *only* of the material is measured (except in certain cases, to which I shall hereinafter allude), all tenons, &c., being considered in the price.

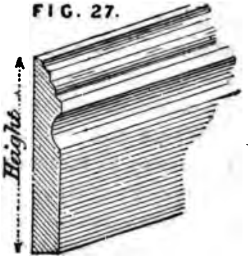
In the Joiner I would advise the same course of procedure as in the preceding trade—namely, floor by floor, completing one floor before the second is commenced. Begin with the flooring, then take the skirtings, next the windows and doors, staircases, &c. &c., as will be shown, taking the ironmongery as it occurs. Proceed then with the

Floors.—Take the length by the width from wall to wall (including skirting), and add for all the additional pieces of flooring, such as filling into recesses, windows, &c. Give the thickness of the boards, and a description of the material, with the method of laying same, whether straight joint, folding, dowelled, or otherwise. It is also necessary to state the width, or gauge, of the boards, specifying whether batten, or as the case may be. Make the deductions for all projections, well-holes, &c., also for the slabs to fire-places, though many surveyors make no deduction in the latter case, but allow it as an equivalent for the additional labour in putting a mitred border to the slab; but where no mitred border is provided, however, they deduct it. It is best, however, to make this deduction in either case, and then to take the border separately; but it having been already measured in with the flooring, it would only be described as "extra to glued and mitred border to 1¼-in. flooring," or as the case may be, the item being a "running" one, taking the extreme dimensions each way for the length; the width of the border, not being necessary, is not given, but the thickness of the flooring must be stated. Take a measurement where special features occur, as for sinkings for mats, &c., such measurements being described as "extra to sinking in floor for mat," or as the case may be; and if mitred border be provided round the same, take it as described to slabs. Where the room is irregular, it will be necessary to ascertain the average size of the flooring, so as to arrive at the net area, and make an allowance for all irregular cuttings, taking the length by a width of 3 in. for the cutting and waste.

Scribing flooring to walls is measured by the foot run, stating the thickness of the floor, and is described as "Scribing (inch) floors to walls." Enumerate any notchings.

Skirtings.—Collect on "Waste" the lengths of the several walls, making the deductions for doors, chimney-pieces, &c., and bring the total length of skirting to each room, forward in one dimension only. It is customary to measure them at per foot run, stating the height, thickness, and the description. Also state if the backings, or grounds, are intended to be included in the one item. If the grounds be taken separately, they are measured by the foot run, stating the length only, and are described as "narrow skirting grounds." It is also advisable to state how the grounds are secured to walls, whether plugged or otherwise. Number all the angles to the skirting, stating whether "mitred" or "tongued"; also the housings into architraves, &c., and any returned ends. These items should in each case be abstracted and billed immediately after the different descriptions of skirtings to which they relate, as by this means labour is saved and an estimate is the better formed of their value, as it can be easily seen to which they refer, and the amount of labour necessary in executing them. If billed among the "Numbers," it will be necessary to state the height and thickness of the several skirtings to which each of them has reference; also whether moulded skirting, or otherwise. In measuring skirtings it is always advisable to give a sketch (I give sketch; see Fig. 27) where it is anything beyond the common mould, and even then it is preferable, as, should it be able to be prepared without making a new moulding plane—that is, should the builder have the plane in stock, he will estimate less for it than where

FIG. 27.



he does not know the character of the moulding, an addition always being made sufficient to cover the expense of a new moulding plane. This is trifling in itself, but may be worthy of note by many quantity surveyors.

Sashes and Cased Frames are measured together as follows:—Take the measurement between the pulley stiles, and add 4 in. on each side (being the width of the frame) for the total width. For the height, take from the top of the oak sill to the under side of the head of the frame, and add to this dimension 7 in.—4 in. being for the head, and 3 in. for the sill. This calculation would in each case be carried out on "Waste," so that the one dimension need only be brought forward for each sash and frame; thus:—

Width between pulley stiles	3·0
Add for frame, two 4 in.	8
Total width	3·8
Height between head and sill	6·0
Add for head and sill	7
	6·7

3·8 6·7	24·2	Deal-cased frames, oak sunk and weathered sills, and 1¾ in. deal moulded sashes, double hung, with patent sash-line, brass axle pulleys, and iron weights.

It is always necessary that a full description should be given, as above, stating the thickness and description of the sashes, and the description of sash line, pulleys, and weights. It is also necessary to state whether the sill is oak or otherwise, and the labour on same, whether sunk, weathered, &c. The sash fastenings are taken separately and the description given.

Where the sashes and frames have *circular heads*, it is customary to measure the portion that is square (that is, up to the springing line) and to abstract it with the foregoing, but to take the circular head separately, measuring it as if square, taking the greatest dimensions each way, with the allowance for head and width as before expressed to ordinary sash-frames, and to make a separate item of it, describing it as "circular head to sashes and frames, measured square." Or another way is to measure the whole sash and frame as if square, and take the circular head separately, and describe as "extra only to circular head to sashes and frames, measured square." This I think preferable, and I have so described it to be taken in the Table. Where sashes and frames are *circular on plan*, it is necessary to take the girth instead of the net width, with the same allowances as for straight sashes; and they require to be separately described as "circular on plan," in addition to the ordinary description. Should they be described as "*circular circular*," that is, circular on plan and circular in elevation, it will be necessary to keep the portion which is "circular circular" separate from that which is only circular, measuring, as stated, to circular-headed sashes and frames; and they would consequently be described as "extra only to circular heads to circular sashes and frames, measured square," and would follow in the bill immediately after the circular sashes and frames. Where the thickness of the several members of the frame, as hanging stiles, parting bead, &c., are beyond the ordinary, it should be so stated in the description.

Where the sashes are fixed, they are measured similarly to those that are hung, the only difference being in the description.

French Casements are measured the net dimensions of the casements exclusive of frame, and described according to the thickness and workmanship. Where the casements are rebated, the dimensions must be taken to the extreme of the rebate each way. The frame would be measured and described as "cube fir in wrought, rebated, and staff-beaded casement frames," or as the case may be. Be sure in the measurement for the frame to add the tenons. Transoms and mullions are also measured solid and described. Sills are taken at per foot cube. If patent or other water bar is specified, measure it at the same time. State how the casements are hung, and generally describe the same fully. *Sashes fixed or hung on centres* with solid frames are similarly treated.

The method of measuring circular heads to casements will be described hereafter, in treating of door frames.

Window Linings.—After the sashes and frames, proceed to measure the linings, taking them the net length shown, and adding for the passings, for the one dimension; and the width forms the other. State the width and give description. The labour to the groove, when they are grooved, is generally taken separately. It will form a running dimension, the length being the same as that for the linings.

Window Boards are measured by the foot superficial, taking the length by the breadth; and when they are grooved into the sill, the labour to groove should be taken separately, as described to the linings. If the sill be of oak, it must be described as "labour to groove in oak," as, necessarily, greater labour would be entailed than if executed in fir. Give the description of the window board, firstly stating the thickness; and where the corners are rounded and returned, it is customary to number them as "returned and rounded ends to window board," and if the boards are notched, this must be stated in addition.

Where the window linings or window boards are on the splay, it will be necessary to keep them separate from those on the square.

The *Framed grounds* are measured the extreme length each way, that is, taking the dimensions on the outer edge both for the height and width of the window; or another way is to take the *net* height and width of the jambs, and allow four times the width of the grounds to allow for the framings; both results being of course the same. The latter I think the preferable, the collections for length being made on "Waste," thus:—

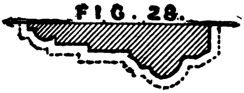
Height of jamb	6·0
Ditto	6·0
Length of head	4·0
Framings, 4·4 in.	1·4
Total length	17·4

This is brought into the dimension column and the width stated. Also, specify the thickness and description, thus:—

17·4 4	5·9	Inch deal framed grounds.

Architraves.—Measure the architrave mouldings by the foot lineal, and specify the girth of the moulding. (See Fig. 28.) The round of the moulding is taken along the outer edge for the length. Number all the mitres and state the girth of the mouldings to which they refer, as will be shown hereafter in the Table. Some surveyors take the mouldings where over 4 in. girth by the foot super, but I prefer to measure all by the foot run for the sake of uniformity. Any pateras at the angles must be numbered, as also plinths where they occur, as, for example, to stop the skirting where it projects beyond the face of the architrave. Should the moulding to skirting be carried round window to form architrave, as is sometimes the case, do not omit to take the additional mitres.

FIG. 28.



Window backs are measured the length by the height, the latter being taken from the floor to the under side of the capping. In addition to the visible length, it will be necessary to add the thickness of the framing on each side. Thus, if the visible length of the back be 4 ft. 0 in., and the thickness of framing 1¼ in., we should collect on "Waste":—

Length	4·0
Two Passings	2½
	4·2½

by which means we obtain the total length. State the thickness of the framing and give a full description of the workmanship. The capping is taken separately at per foot lineal, and described according to the nature of the work upon it. The following is an example of how these would appear in the Dimension-book, the length being ascertained on waste as above:—

4·2½ 1·6	6·4	1¼ in. deal moulded and framed two-panel window back.
4·0	4·0	Deal beaded capping.

The elbows are measured similarly to the window backs, taking the extreme widths, including the passings, for the one dimension, and the same height as the back (viz. to under side of capping) for the other. The soffits are also measured the full dimensions each way. Describe how they are finished, whether splayed, plain, keyed, or framed in panels; and, if the latter, the number of the panels, and whether moulded or otherwise. The caps to elbows and clearing-pieces are numbered. The labour to splayed ends is measured at per foot run, as shown in the Table.

Boxing shutters are measured by the foot superficial, taking the height by the extreme width, including all the rebates. State the thickness of the shutters and description of framing; also state the number of heights in which they are hung, if more than one. Back flaps are also measured in this manner. Number all the ironmongery as it occurs; also the holes cut for the shutter bars.

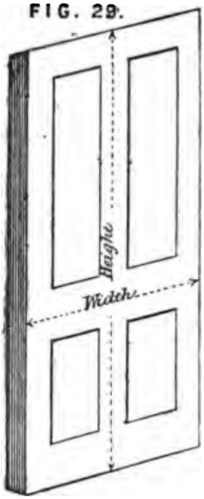
In measuring the back linings, add 2 in. to the height of the shutter for the length; take this by the width, and state the thickness and description. If grooved, take a running dimension of the groove for labour. Shutter boxings are measured the height by the width, including all the framings; and state the thickness and description, whether "proper" boxings or otherwise—proper boxings being wrought, framed, rebated, splayed, or beaded.

Sliding shutters are measured by the foot superficial, stating the thickness and description of the framing, and also the hanging, &c., as to sashes and frames. The flap to cover the same is measured by the foot run, if under 6 in. wide. Number the ironmongery.

Doors.—Measure the width by the height, stating the thickness of the framing and the number of the panels; also the mode of finishing, whether bead-butt, moulded, &c.; and if the panels are raised, or are completed differently to the ordinary, it must be so described, as it is necessary, as I before stated, that the description should be full and explicit. In all cases, take the description from the specification, when working from one. Where the doors are double, and are hung folding, the width of each door must be taken to the extreme edge of each rebate. If the doors are hung with rising butts, state so, as it will necessitate the head lining and the top rail of door being splayed, as shown in Fig. 29.

In measuring ledged doors, it will be necessary, in addition to the net thickness of the door, to state separately, the number and sizes of the ledges, and to note whether the boarding is wrought, ploughed, tongued, and beaded, in which case they are designated as "proper ledged doors," such description rendering further description unnecessary. Should the boarding, however, be differently finished, it will be necessary to describe it as it is worked. Where the doors have circular heads, the course usually adopted is to measure them as square, taking the full height and width, but specifying them as "doors with circular heads." Gothic heads, and heads with quadrant corners, are similarly measured, but each kept separate, and so described. A sketch is generally advisable in the two latter cases, as it greatly facilitates matters by the better exemplifying the true shape and character of what is intended. Sash doors are measured as above, and it is customary to measure with them the shutters, where these are provided, taking the length by the height, including the rebates where any are provided, and describing the method of framing, whether bead-butt and square or otherwise. Where a rim is necessary for the support of shutter, measure it by the foot run on the outer edge, and describe it as "wrought, rebated, and moulded rim," or whatever it may be. After you have completed measuring the door, take the hinges, locks, bolts, and fastenings, giving the sizes and description in each case, so that one door may be completed before commencing a second; and the same with the lifting shutters, numbering the stubs and plates, shutter lift,

FIG. 29.



and thumb-screw fastenings. In the case of entrance doors, all the additional fastenings, as knocker, knob, door chain, &c., would be taken off with the door in like manner.

Where a number of doors occur of the same size, it will not be necessary to repeat the dimensions, but the number of times the item occurs should be placed to the left of the dimensions, as stated previously; but as it is advisable not to confound the articles on one floor of a house with those on another, they should be kept separate, and yet be included in the one dimension. To explain this, supposing we have seven doors of a given dimension (say 3 ft. by 7 ft.) on the ground floor, and an equal number of the same size and description of door on each of the second and third floors, this could appear in the Dimension-book in either of the following ways (the total of the doors would be 21):—

			A.
21	3·0 7·0		2 in. deal four-panel square door.
			Or B.
3/7	3·0 7·0		2 in. deal four-panel square door.
			Or C.
7·7·7	3·0 7·0		2 in. deal four-panel square door.

Example A, I have already explained; in example B, the dash between the 3 and the 7 signifies that the latter figure occurs three times, and consequently denotes the multiplication of those numbers. In example C, the dots denote the addition of the numbers between which they are placed. Both the examples B and C frequently occur in taking off quantities, B being used where the same quantity is repeated, and C more usually where different numbers of the same article are to be added. In the example given, B would be employed; but supposing the number of these doors on the 1, 2, and 3-pair floors to be respectively 10, 5, and 6, we should employ the mode adopted in example C, that of B being of course inapplicable; and the example A not being advised except where the article is all on one floor, as previously stated.

In measuring the door frames, take the height of the door, and double it for the two sides, and include on each side the tenons into the head, and an additional two inches on each side for stubbing into the sill; add to this the width of the door, and twice the thickness of the frame, and an additional six inches for the horns. The whole of these dimensions must be collected on "Waste," and the total brought forward and the scantling stated, with full description of the work. Wrought, rebated, and beaded frames are usually termed "proper door-cases." To give an illustration of the above method, take a door 3 ft. 6 in. by 7 ft. 6 in., the scantling of the frame being 4 in. by 4 in.:—

Height of door for one side	7 · 6
ditto other side	7 · 6
Add for two tenons	8
Ditto two stubs	4
Width of door	3 · 6
Two thicknesses of frame	8
Extra width for horns	6
	20 · 8

20 · 8 4 4	2 · 4	Fir proper door frame.

It will be seen from this that the measurement of door frames is similar to the measurement of the timbers in the carpenters' work, inasmuch as all tenons, &c., are added to the net dimensions. Many surveyors, for this reason, take it off and abstract and bill it with the Carpenter; but I think that as it is actual joiners' work, being prepared at the bench, it is better to take it off with this trade, it being advisable always to affix the various items to the various trades by whom they are severally prepared. When the head is circular it must be kept separate, and described as "To circular head of door frame." Where there is a transom, it is measured in with the door frame (being, in fact, part of the frame), if it is similarly worked; if it is differently worked it must form a separate item, and is in this case better measured by the foot run. In either case, the tenons must be included in the measurement for the length.

Oak sills are measured and kept separate from the frames, and the description of the labour upon the same must be stated, whether wrought, weathered, framed, &c. In measuring them, take the length by the scantling, and bring all to the foot cube, the greatest dimensions being taken each way.

Jamb Linings, &c.—The following is the method of measuring jamb linings (see Fig. 29). Take twice the height of the door for the two sides, to which add the width of the door for the soffit, and add for the passings four times the thickness of the linings,—thus, supposing the jamb linings to be 6 in. wide and 1¼ in. thick (door 7 ft. by 3 ft.), collect on "Waste":—

Height of door for one side	7 · 0
Ditto other side	7 · 0
Width for soffit	3 · 0
Four times thickness (1¼ in.) for passings	· 5
	17 · 5

17 · 5 · 6	8 · 9	1¼ in. deal double-rebated and double-beaded jamb linings.

To obtain the width of the jamb linings add to the thickness of the partition the thickness of the door grounds on "Waste," thus:—

Partition	4½
Two grounds	1½
	6

It will be necessary to describe the nature of the work, whether single or double rebated, beaded, &c. &c.; and where dovetailed or other blockings are provided for hinges and lock, they must be numbered and described as "extra to." Where the linings are tongued to door frames, they must be kept separate from the other linings, and described accordingly.

Framed door-grounds are measured as follows:—To the total of the jamb linings add four times the width of the grounds for the passings, and state the thickness. Taking the example just given, and presuming the grounds to be 4 in. wide, we obtain

Jamb linings	17 · 5
Four times 4 in. for passings	1 · 4
	18 · 9

18·9 ·4	6·3	¾ in. deal framed grounds.

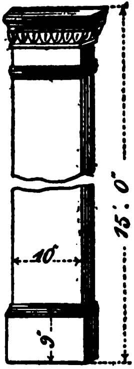
The labour must be described according to the nature of its execution.

Architrave mouldings are measured by the foot run, stating the girth and numbering all the mitres, and stating the girth of the mouldings, as explained to windows.

Dados.—Measure the dado by the foot superficial, taking the extreme length by the net height, and state the thickness. It will also require to be described, whether simply ploughed and tongued, wrought one side, or whether framed in panels, &c. &c.; and if framed in panels, the nature of the framing. Also state the nature of the backings, and whether they are intended to be included in the one item. It is customary to measure base and surbase mouldings, where over 6 in. girth, by the foot superficial—under that, by the foot run. State the nature of the moulding in each case, and girt it for the width, including the rebates. Number the mitres, housings, &c. The plain plinth would be measured by the foot superficial, taking the extreme dimensions for length and height, including tenons and housings, the mitres, housings, &c., being numbered as described to skirtings. Where the dado, &c., is circular, so describe the several items, and keep the circular portions separate from the straight. Intersecting mitres should also be kept separate from the ordinary. Moulded plinths are measured the same as those described to the dado, taking the plain part first; the extreme length by the height, including housings, rebates, &c., the thickness and description being stated; also state whether backings are included in the one dimension, if not, they must be taken separately at per foot run, as described to skirtings. Girt the moulding for the width, taking the same length as to plinth—when over 6 in. girth, they are measured by the foot superficial—under that, by the foot run. Number mitres, housings, &c., and if the work is circular, describe it as stated to dado.

Pilasters (Fig. 30) are measured by the foot superficial, collecting the round or girth of the pilaster for the width. Thus, if face be 10 in. wide, and the returns 2 in. each, the width would be taken as 14 in. Take the height from the floor to the top of the capping. Describe the nature of the work fully, and the thickness of the material, stating whether framed, or otherwise.

FIG. 30.



Take the mouldings to capping and necking and to plinth separately, by the foot run, numbering the mitres. The plinth would be measured in with the pilaster. It would therefore only be necessary to add for the projection. The mouldings to panels, where any, would be included in the description, and not be separately measured.

Columns are measured by the foot superficial, taking the height by the girth, and stating the diameter. Give full description, stating whether glued up in narrow widths and closely blocked, or as the case may be; also whether the column is straight or diminishing. Measure the caps and bases separately, and state whether glued upright and blocked for turning, or whether glued parallel, or in thicknesses, &c. Measure the grooves as to necking by the foot lineal, also any fluting in like manner, numbering the stops. Any carving to caps would have to be taken separately, and the caps numbered according to size, stating the nature of the carving.

> NOTE.—Some carvers take four times the diameter of the shaft of the column measured under the necking, for the circumference of the cap. This method, in my opinion, is not satisfactory. It is better to give a sketch figuring the height and diameters.

Framed Partitions are measured superficially, taking the length by the breadth, and stating the thickness. Give full description of the work, whether square, moulded one or both sides, &c. &c., and number any angle-irons for securing the same, &c. The doors in same are measured in, and the dimensions of the door again taken separately, and described as "extra labour to doors in do." Run the fillet round door, taking the dimensions round the outer edge, and describe it. Circular corners are measured by the foot run, and described as "extra."

Cupboard Fronts are measured similarly to framed partitions, the doors in same being also described as "extra."

Spandrel Framing to stairs, &c. (see Fig. 31), is measured

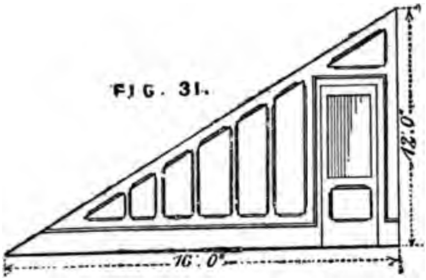


FIG. 31.

net, to obtain which the length is taken by the full height and halved thus:—

½	16·0		1½ deal, wrought both sides, and stop-chamfered spandrel framing.
	12·0	96·0	

The thickness and description must be stated, as shown in the example. Measure the doors in as described, to partitions, and afterwards charge the additional labour on the same as an "extra." Take all fastenings to doors at the time of measuring them.

Shop Fronts.—Measure the stall-board by the foot lineal, stating scantlings and the nature of the labour on the same; also transoms and any other timber, stating fully the method of finishing. The lining under stall-board, the show-board, and lining under, are measured superficially, stating the thickness and quality of the material and workmanship. Note any trimmings for basement lights, and make the deductions and additions for the same where they occur. The shop-sash is measured by the foot superficial, taking the extreme dimensions each way; state fully the nature of the work, and the thickness and quality of the stuff, how secured,—whether guard-bead outside and shifting beads and brass screws and collars inside, or whatever way may be adopted. Also state the number of lights.

The measurement of the door would be the same as already described to other doors.

Take the fascia by the foot super, and also any linings to breastsummer, story posts, &c.

The measurement of bracketing for cornice has already been described in the Carpenter.

It is also customary to measure with the Joiner any putty composition, including the fixing in wood framing, taking it at per foot run, stating the width and nature of the mould, and whether straight or circular,—all mitres being numbered.

Shop shutters are measured by the foot superficial, taking the net dimensions of the whole surface for rebated shutters, and stating the thickness and nature of the framing. Number all ironmongery as it occurs.

Patent iron, or wood, revolving shutters, are also measured by the foot super. Take care, at the same time, to make a provision for attendance, in all trades, in assisting to fix the same, including cutting away the stone or other work, where necessary, and for additional movable casing, &c., as may be needful for access to the gear.

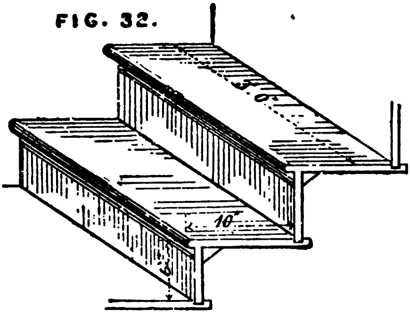
Staircases.—In measuring staircases take firstly the length of the tread, including the housings into strings, for the one dimension, by the height of riser, *plus* the width of tread for the other, the extreme dimensions being taken in each case. This will give the dimension for one tread and riser, which will have to be multiplied by the number of such steps. Presuming we have ten fliers 3 feet long, as sketch (Fig. 32), they would appear in the Dimension-book thus:—

	in.
Width of tread	10
Height of riser	6
	1·4

10	3·0		1¼ in. deal treads with moulded nosings, and
	1·4		1 in. deal risers, upon strong fir carriages;
	—	40·0	and glued, blocked, and bracketed.

State the thickness of the tread and riser as shown in the example given, and also how the nosing to tread is to be finished, either rounded or moulded; also if it is to be returned round the step. It is advisable to give the sizes and number of the carriages under stairs, where stated in the specification; but this is very seldom done, they being in great measure left to the option of the builders.

FIG. 32.



Where the steps are mitred to string it is necessary to state so, and also whether the treads are glued and blocked. If the risers are tongued at each edge, measure the grooving and tongueing by the foot run; also specify if the winders are feather-tongued. Where the bottom step is finished differently from the others, as a curtailed or bull-nosed step, it will have to be kept separate, and numbered according to the description. Where a nosing is run on the floor, as to the top step, it must be taken and described as "—feet run of deal moulded nosing on floor to form upper step." The riser in this case would be measured in with the stairs.

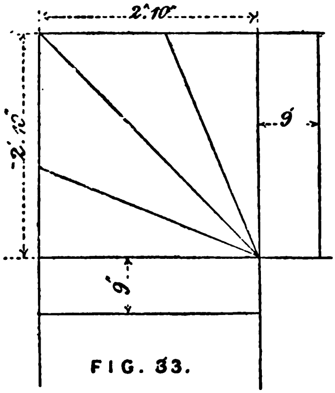


FIG. 33.

In measuring the winders it is customary to take the entire space occupied by them, whether quarter space or otherwise, adding to the width an additional inch for the projection of each nosing, and collecting the heights of the several risers. Thus:—

Tread	2·10
Housings	2
2 Nosings	2
	3·2

3·2 3·2	10·0	Feather-tongued winders.

It will be necessary to add to this dimension that for the risers, so that both the treads and risers in winders may be abstracted together. In this case as the risers are of different lengths they must be collected on "Waste," and the whole brought forward in one item, thus:—

3·0
3·6
4·3
3·6
14·3

14·3 6	7·2	Add risers collected.

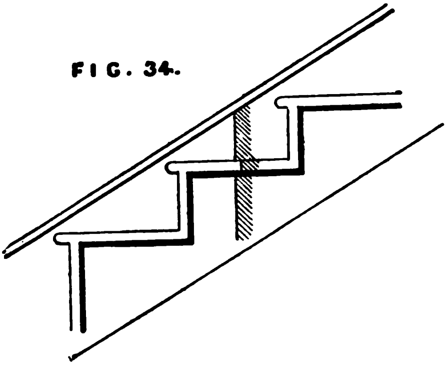
These dimensions added would give the area of the treads and risers in the winders, which, as I have before stated, must be kept separate from those of the straight steps which are technically called fliers.

Number the housings to treads and risers, keeping those to winders separate from those to fliers. Brackets are also numbered and described according to the nature of their execution, keeping the circular brackets to winders separate from the straight to fliers. Also, number and describe the curtail end to bottom step as before stated, and also the dovetailed sinkings for balusters, where they occur.

As some of my readers may not understand what is meant by a "housing," I have thought it desirable to give a sketch in explanation (see Fig. 34).

Measure the *strings*, taking the extreme lengths, including all housings, &c., by the width, the latter generally being *assumed* to be 12 in. State the thickness of the material, and give full description, stating whether plain wall string, rebated and beaded outer string, sunk or moulded ditto, also if mitred to risers, &c. Specify if wreathed, how wreath is formed, whether solid or in thicknesses, &c. All ramps are included in the one dimension for the length of string, but afterwards they are numbered as "*extra* to ramps in the moulded wall string," or as the case may be. Also number all the housings, angles, and ends, stating whether splayed or returned, and the description of the string.

FIG. 34.

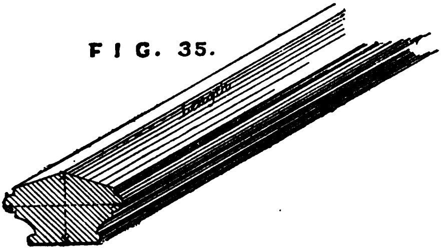


Measure linings to *well-holes* by the foot superficial, describing the thickness of the material and the quality of the labour upon the same.

Take the length of the *handrail* along the centre of the top of the rail, keeping the portions that are ramped, wreathed, and scrolled, each separate from the straight. The level portions, where circular, must be also kept distinct. Describe the nature of the handrail, whether moulded or otherwise, giving sketch if moulded; and also the material, whether solid or veneered, and if French polished; and give the size, being the largest dimension each way (see Fig. 35).

Take the labour to fitting and fixing the iron core at per foot run, describing whether straight or circular; also the sinking for same in a similar manner. Take the mitred and turned caps on newels at per number; also number the screw-nut and joint to caps, handrail screws, and fixing, &c. Where the openings to

FIG. 35.

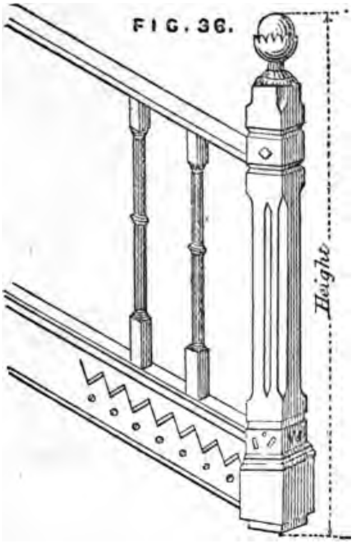


well-holes are small, it is customary to give the width of them, as the diminished width increases the cost of preparing the circular portions of the handrail inclosing the same. The limit of width is generally understood to be about 16 in., all below this being so described.

In measuring newels, take the total length, including the tenon, and give the full scantling of same, measured where the dimensions are the greatest. Fully describe the labour on the same, and the turnings, if any. Iron newels are measured in the same manner as the foregoing, and billed with the Smith, the labour in fixing being, however, billed with the Joiner, and also the labour and material in preparing mould for casting.

Balusters are measured by the foot run, including the tenons. It will be necessary in describing them to state the size, if nailed at both or either end, or if dovetailed. When the balusters are turned to pattern, as sketch for example (Fig. 36), it is best to number them, stating the height and size, and giving a full description of the same, with the mode of fixing as before. Iron balusters can be measured by either of these ways, as they are afterwards reduced to weight as shown in the Smith. Ornamental iron balusters, however, must be taken at per number, and it is customary to fix a p. c. (prime cost) price to them. Where they are not intended to be selected from a pattern-book, but to be executed from special design in cast n, take labour and material in preparation of mould for the same. In all cases where of iron, take labour for fixing at per number.

FIG. 36.



Closet Fittings.—Take firstly the seat and riser, measuring the extreme depth of the seat, and adding to this, on Waste, the height of the riser. (See Fig. 37.) This will give one dimension, and the extreme length will form the other, and the item would be described as "inch (deal) seat and riser, and fir bearers," according to thickness. The flap and frame is measured the length by the width, and described, the thickness being stated. Take the skirting round seat at per foot run, stating dimensions and description, and whether moulded or otherwise, numbering the mitred angles and returned ends. Take a running dimension of the nosing on the seat, and state whether moulded or otherwise. Number the hole cut and dished in seat, the hole cut and beaded for handle, also the paper-box, if provided, stating description, and take the ironmongery as it occurs.

Kitchen Dressers, Plate-racks, &c., are generally numbered, and the full description from specification quoted with the p. c. (prime cost) if stated.

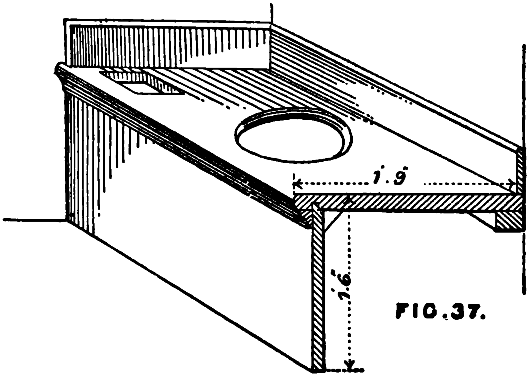


FIG. 37.

Sinks.—These are also numbered, with size stated, and description.

Having concluded the description of the various articles in joiners' work *seriatim*, I should like to preface the Table of admeasurement with a word or two. Firstly, as to the order in which I have arranged the various descriptions of labour and material. Of course, where such a multifarious list of articles appears, as in this trade, differences of arrangement are sure to exist. The course I have adopted is to keep as much as possible the different descriptions of labour with the various articles to which they refer. Thus, commence with the floors, and abstract and bill all labours appertaining to the floors before commencing the skirtings. The same with the skirtings. Then take sashes and frames, doors, linings, shutters, staircases, water-closets, &c. &c., keeping them all separate, as shown in the Table. Many surveyors do not follow this course, but prefer to arrange them all according to their thicknesses, without regard to what they refer to, commencing the list with those of the least thickness, and proceeding in this way to that of the greatest thickness. These different thicknesses are again arranged according to the quality of the work, that of the least value being placed first. With all due deference to those who follow this course, I think that which I have proposed to be the best, and therefore recommend its adoption.

This Table is not intended to include *every* description of labour in the trade. In a work like the present this would be unadvisable, and indeed impracticable. I have, however, given sufficient examples to enable the reader fully to understand the text of the book, the method of measurement, and the order of taking out, abstracting and billing them. I have also made them as diversified as possible, as will be seen on reference to it. The whole of the various items are presumed in the present case to be in deal, for the sake of making the Table as short as possible. Where the work is in oak or mahogany, it should be kept separate from the deal, and brought into bill after the whole of the deal has been abstracted. Where both oak and mahogany appear, it is customary to give the oak precedence. French polishing, where described in the specification, must also be included in the description in the bill of the joiners' work.

The ironmongery is kept separate from the woodwork, as shown in Table VIII.

TABLE VIII.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Inch deal flooring, laid folding	At per square of 100 ft. super.
Ditto yellow batten flooring, laid straight joint	"
Ditto, ditto, with splayed headings	"
Ditto, ditto, with ploughed and tongued headings ..	"
Ditto, ditto, dowelled	"
Extra to sinking in floor for mat, with straight joint all round	At per foot super.
Scribing inch floors to walls, &c.	At per foot run.
Extra to mitred border to slab in inch flooring	"
Ditto, ditto, to door-mat ditto	"
Close joint to old floor	"
¾ in. × 7 in. deal square skirting, including backings	"
1 in. × 7 in. ditto torus ditto and ditto	"
1¼ in. × 9 in. ditto moulded ditto and ditto	"
1½ in. × 12 in. ditto, ditto, and sunk ditto and ditto ..	"

Tongued or mitred angles—*extra to*	At per number.
Housings *ditto*	,,
Ramps *ditto*	,,
Splayed ends *ditto*	,,
Returned ditto *ditto*	,,
Inch deal narrow grounds plugged to walls	At per foot run.
Inch deal wrought and tongued dado	At per foot super.
1½ in. deal plain pilasters, mitred together, glued and blocked	,,
1½ in. diminished columns glued up in narrow widths and closely blocked, 12 in. diameter	,,
1½ in. deal moulded fixed sashes	,,
Ditto hung on centres	,,
Deal cased frames, oak sunk and weathered sills, and 2 in. deal moulded sashes, double hung with brass axle pulleys, patent lines, and iron weights	,,
Extra only to semicircular heads to sashes and frames as above, measured square	,,
Deal cased frames, oak sunk and weathered sills, and 2½ in. deal moulded sashes, circular on plan, double hung, with brass axle pulleys, patent lines, and iron weights	,,
Extra only to circular heads and sashes and frames, as last, measured square	,,
Deal cased frames, oak sunk and weathered sills, and 2 in. deal ovolo sashes to Venetian windows, double hung with brass axle pulleys, patent sash-lines, and iron weights, the side lights to be fixed lights	,,
1½ in. deal bead butt and square lifting shutters	,,
Ditto bead flush and square back flaps	,,
Ditto deal moulded shutters, bead butt at back, hung in three heights	,,
Ditto proper boxing grounds on splay	,,
Deal wrought and moulded rim screwed to door	At per foot run.
Fir in proper door cases	At per foot cube.
Inch deal proper ledged door	At per foot super.
1½ in. ditto framed, ledged, and braced doors, filled-in with inch matched and beaded battens	,,
2 in. ditto framed and braced door, filled-in with V-jointed battens, grooved and tongued, to have quadrant and square corners	,,
Ditto, ditto, four-panel and square door	,,
Ditto, ditto, panels moulded one side	,,
Ditto, ditto, moulded both sides	,,
Ditto, ditto, two-panel bead butt and square door	,,
Ditto, ditto, three-panel, bead flush both sides doors, with diminished upper stiles, upper panel open for glass	,,
2 in. deal three-panel bolection moulded and bead flush door, the upper panel open for glass, with moulded movable stops	,,
Ditto, ditto, ovolo sash door, the two lower panels to be moulded both sides	,,

Ditto, ditto, rebated folding doors, in four panels each fold, panels moulded both sides	At per foot super.
2¼ in. ditto framed and braced doors, filled in with 1 in. battens, matched and V-jointed, and the framing stop-chamfered	"
Ditto, ditto, folding doors hung with swing hinges, lower panels bolection moulded and raised on one side, and flat moulded and raised the other, upper panels open for glass, with large bolection moulding one side and brass screws the other	"
Inch deal wrought and framed grounds	"
Ditto, ditto, to segmental heads	"
Inch deal wrought one side and beaded linings, including backings	"
Ditto, ditto, tongued to frames and ditto	"
Ditto, ditto, splayed linings and ditto ditto	"
Ditto, ditto, and double-beaded and cross-tongued linings and backings to opening	"
Ditto, ditto, tongued and staff-beaded lining to segmental heads	"
Ditto, ditto, tongued and rounded window boards and bearers	"
Ditto, ditto, two-panel moulded window backs and backings	"
Ditto, ditto, moulded elbows and ditto	"
Ditto, ditto, on splay	"
Ditto, moulded soffit with splayed ends	"
Labour to groove	At per foot run.
Ditto, to cross groove	"
Ditto, to groove in oak	"
Ditto, to splayed cutting to inch linings	"
Notched, returned, and rounded ends to window boards	At per number.

DEAL IN THICKNESS.

¾ in. one side matched and beaded batten boarding, plugged to walls	At per foot super.
Ditto, ditto, boarding in 4½ in. widths to ditto	"
Ditto, ditto, fixed on and including 1 in. battens to ditto	"
⅞ in. one side and staff-beaded casings	"
Ditto, both sides matched, beaded, and ledged batten boarding	"
Inch one side and V-jointed boarding, fixed diagonally	"
Ditto, ditto, ploughed and tongued shelves and bearers	"
1¼ in. both sides framed and beaded cupboard front	"
Extra only labour to door in ditto	"
1½ in. both sides and cross-tongued batten boarding to spandrel	"
1½ in. deal wrought, both sides ploughed, tongued, and dovetailed cistern	"
Ditto, proper ledged folding flaps to ditto	"

2 in. deal framing, panels moulded on both sides, properly secured to floor and ceiling	At per foot super.
Extra to circular corner in ditto	At per foot run.
Labour to rounded edge	„
Ditto bead	„
Ditto rebate	„
Ditto rebated and mitred angle to lining	„
Wrought fillet	„
Deal beaded capping	„
1½ „ plancere	„
Deal moulding 3 in. girth	„
Ditto, architrave ditto, 4 in.	„
Ditto, ditto, 5 in.	„
Ditto, (circular) ditto 5 in.	„
Mitres to 5 in. moulding	At per number.
Deal moulded cornice, 6 in. girth	At per foot run.

STAIRCASES.

¾ in. deal wrought risers	At per foot super.
Ditto, ditto, and beaded fascia	„
Inch ditto, ditto, wrought treads and risers, glued, blocked, and bracketed, with rounded nosings and strong fir carriages	„
1¼ in. ditto, ditto, with moulded nosings and ditto	„
Ditto, ditto, in winders	„
Ditto, plain wall string	„
1½ in. ditto moulded ditto	„
Ditto, ditto, cut and mitred outer string	„
2 in. deal moulded nosing	At per foot run.
3 in deal wrought and square framed newel	„
3½ × 3 in. deal moulded handrail	„
1 in. deal square bar balusters	„
Housing treads and risers to close string	At per number.
Ditto, ditto, winders ditto	„
Ditto, treads and risers to cut and mitred outer string	„
Ditto, ditto, winders ditto	„
Ditto, treads and risers to newel	„
Ditto, strings to ditto	„
Ditto, handrail to ditto	„
Ditto, for balusters	„
Tongued and mitred angle to wall string	„
Extra to ramp in moulded wall string	„
Ditto, ditto, in cut and mitred outer string	„
Cut and mitred brackets to steps	„
Returned and mitred moulded nosings to fliers	„
Ditto, ditto, winders	„
Extra to rounded end to step and riser	„
Extra to curtail end to step	„
Ditto splayed ends to deal handrail	„
Ditto end of handrail cut and pinned	„
Ditto mitred cap ditto	„

Turnings to newel	At per number.
Cut pendants	"
Cut and chamfered caps	"
Ornamental newels (with description)	"
Ditto, balusters (ditto)	"
Extra to ramp in handrail	"
Ditto wreath ditto	"
Ditto scroll end ditto	"
Screw nut and joint	"

WATER-CLOSETS.

Inch deal seat and riser made moveable, with proper bearers	At per foot super.
Ditto beaded frame and mitre clamped flap	"
Skirting round seat	At per foot run.
Mitred angles to skirting	At per number.
Returned ends do.	"
Holes cut and dished for seat	"
Ditto cut and beaded	"
Deal paper-box (with description)	"

KITCHEN AND SCULLERY.

Deal dresser (with full description)	At per number.
Ditto plate-rack ditto	"

IRONMONGERY.

Including screws and fixing	At per number.
Pairs butts (according to size, stating the smallest sizes first, and keeping the cast and wrought iron separate, also the brass)	"
Ditto rising butts (ditto)	"
Ditto back flaps (ditto)	"
H or HL hinges, ditto	"
Cross garnet hinges	"
Patent swing hinges for 2 in. doors, and letting in floor	"
Pairs steel centres on plates	"
Necked bolts (stating size)	"
Barrel ditto, with brass throw (ditto)	"
Brass flush ditto (ditto)	"
Gothic cast-iron door-knob	"
Ditto knocker	"
Iron barrel door-chain	"
Norfolk latches	"
Brass-cased pulpit latches	"
Mortise latches	"
Cupboard locks	"
Dead locks (stating size)	"

Iron rim-locks and brass furniture (stating size)	At per number.
Mortise locks and ditto	,,
Rebated ditto, ditto	,,
Two-bolt mortise lock and ditto, ditto	,,
—— patent lock, p. c., 21s.	,,
Sets white china furniture	,,
Ditto black and gold ditto, ditto	,,
Pairs, porcelain finger plates	,,
Brass spring sash fastenings	,,
—— patent ditto ditto	,,
Brass knob turn-buckles	,,
Ditto thumbscrews	,,
Iron stubs and plates	,,
Ditto shutter lifts	,,
Brass ditto latches	,,
Brass quadrant regulator fastenings, with pulleys, lines, and hooks, complete to fanlights	,,
Leather straps and brass buckles and plates to spring doors	,,
Iron tongue and groove	At per foot run.
Wrought-iron balusters	At per number.
Ditto newel (twisted or otherwise)	,,

CHAPTER VIII.

SMITH AND FOUNDER, GASFITTER AND BELLHANGER.

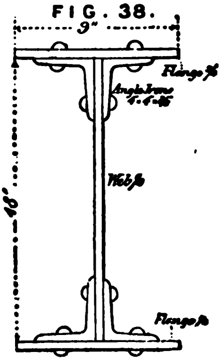
CUSTOMARY COMMENCEMENT — HOW BILLED, HOW MEASURED — WROUGHT IRON—CHIMNEY BARS—FLITCHES—RIVETED GIRDER —EXAMPLE OF T AND CROSS IRON—CIRCULAR COLUMNS— HOLLOW COLUMNS—BOLTS—STRAPS—CAST IRON—ORNAMENTAL WORK—GUTTERS, &C.—ABSTRACTING—PROVISION FOR—TABLE OF WORK—GASFITTER—PIPING—GASELIERS—SUN-BURNERS— FEES TO COMPANY—CUTTING AWAY FOR—TABLE OF WORK— BELLHANGER—TUBES—PULLS, &C.—TABLE OF WORK—ELECTRIC BELLS.

IT is customary in measuring the smith and founders' work to commence with the articles executed in wrought iron, which, owing to the difference in price and workmanship, must be kept separate from those executed in cast iron. Many of the items are taken off with the other trades to which they have reference so as to prevent them being omitted; and with respect to these, it will be necessary to bring them into the abstract, in order that the whole of the trade may be billed from the one abstract.

Ironwork generally is billed at per weight. The exceptions to this rule will be found in the Table. Ironwork is measured from the drawings in feet and inches, and abstracted according to its thickness, the transfer to weight being carried out on the abstract. The means of effecting this are various. I will give one example hereafter, but will firstly speak of the measurement.

Wrought iron.—Wrought iron in chimney and bearing bars is measured by the foot superficial, taking the extreme length, including turnings up and down, by the width, and stating the thickness. These are taken off with the bricklayer. Flitches, which are measured with the carpenters' work, are also measured by the foot superficial. Make no deductions for the holes for bolts, because, if drilled, there would be no deduction, and if punched, the deduction would only be worth the weight of old iron. Number the holes in flitch for the bolts, stating the thickness of the metal. I give an example, showing the method of measuring a riveted girder 20 ft. long, as per Fig. 38.

FIG. 38.



	20·0 1·6		¼ in. web.
	20·0 9		½ in. bottom flange.
	20·0 9		¾ in. top do.
4	20·0 8		⅜ in. angle-irons.
6)		60	2½ in. by ¾ in. rivets.

4
4
—
8
—
20
3
—
60
—

If preferred, the top and bottom flange may be taken in one item, thus:—

20·0 9	1¼ in. top and bottom flanges,

adding the thickness of metal together. The rivets, as will be observed, are taken as 4 in. from centre to centre. The holes should *not* be numbered in this description of girder, as they are included in the item. The weight of the above girder is 17 cwt. 2 qrs., and I leave it to the ingenuity of my readers to work it out for themselves. The weight of iron per foot is given at the end of this trade. I have, as will be observed, taken the extreme dimensions of the angle-irons each way for the width, this being the customary way of measuring amongst engineers. Tee and cross irons are measured in the same way, taking the outside dimensions in each case, as shown in Figs. 39

and 40. By adopting this course, a small additional amount of iron is taken, which provides against any little discrepancies which may arise in its measurement, it being almost impossible to find the exact weight of any girder by simply measuring it from the drawings in the ordinary way. Such, at least, is my experience.

FIG. 39.

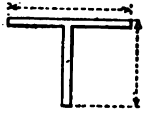
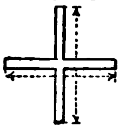


FIG. 40.



In measuring circular columns where solid, it will only be necessary to take the length by the average diameter, making an addition for the cap, base, and caulking. Hollow columns are taken by the foot superficial—the length by the average mean circumference—adding for cap, base, and caulking as before. In the case of solid columns the dimensions would be reduced to the foot cube, and the weight would be easily found.

Bolts are measured by the foot run, stating diameter, the head-nut and washer being taken separately at per foot superficial, and the whole reduced to weight, as shown in the Table. Where the bolts, however, are under one foot in length, it is customary to number them according to their respective lengths and diameters. Straps are taken at per foot superficial, as are also railings, grating bars, and other work of a similar description, and afterwards reduced to weight.

Cast iron is measured in the same manner as wrought iron, and my remarks thereon will therefore apply to this. State at the head of the bill for the cast iron, that the cost for patterns for casting from, is to be included in the several items, or take and enumerate the patterns separately, in which case they should be billed with the Carpenter. This course is, however, seldom taken, the items including both patterns and fixing. The Table shows the method of measurement, and it is therefore unnecessary for me to repeat here. A little difficulty may present itself at first in calculating for the weight of ornamental work, but by experience this is soon got over. It is customary to measure it pretty fully, it being much better to take a little more than a little less.

In measuring the various items as gutters, rain-water pipes, cresting, gates, coal-plates, &c., &c., it will be necessary to give the sizes and description.

In conclusion, I would state that in abstracting, take the several items under the several thicknesses, when they may be reduced to the uniform thickness of an inch, or as preferred.

Wrought iron weighs 40 lb. to the foot superficial of 1 in. in thickness, and cast iron 37½ lb. From these two items the student will be able to arrive at all his calculations. By multiplying by twelve we obtain the weight per foot cube; and by multiplying by ·7854 and dividing by 12 we obtain the weight per foot run of round iron, 1 in. in diameter. Some surveyors trust to table-books, but it is much more practical for the student to work it out for himself.

I may observe that it is a common practice amongst some of the profession, in treating of small buildings, to make a "provision" for many of the items, instead of measuring them, that is, to provide for a certain weight, and whatever is used under or over this amount must form a deduction, or addition, to the estimate, as the case may be; and after considerable experience it is possible to fix the weight in such cases pretty closely, although it is a course which I do not recommend.

TABLE IX.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

WROUGHT IRON (*including Fixing*).

In riveted girders	At per cwt.
„ rolled iron ditto	„
„ chimney and bearing bars	„
„ furnace ditto	„
„ straps and ties	„
„ bolts and ties, with screwed ends, with nuts and washers	„
„ half-round handrails and square or round balusters	„
„ plain window-guards	„
„ framed area gratings	„
„ bolts under 12 in. long, and other small items ..	At per number.
Riveted tanks	At per gallon.
Coppers	„

Cast Iron (*including Patterns and Fixing*).

In plain girders	At per weight.
„ open ditto	„
„ solid columns	„
„ hollow ditto	„
„ heads and shoes to principals	„
Eaves gutter	At per foot run.
Angles	At per number.
Stopped ends	„
Outlets	„
Rain-water pipes	At per foot run.
Heads	At per number.
Shoes	„
Ears	„
Iron cresting	At per foot run.
Finials	At per number.
Shutter bars	„
Air bricks	„
Gratings	„
Brackets	„
Stoves (according to description)	At per in. lineal.
Ranges (ditto)	„
Copper doors and frames	At per number.

Gasfitter.

Gasfitters' work is measured as shown in the accompanying Table. It will be necessary for the surveyor to specify the sizes and quality of the pipe as shown therein, and to number the various fittings to the same as elbows, &c., as *extra to*, beyond the price of the tubing, the lengths of the same being included in that of the pipe. Short pieces of pipe, that is, when under 2 feet in length, are numbered in the same way, also as extra. Of course, it will be unnecessary for me to give the different descriptions of the several articles used in gas-fitting, my object being simply to show how they are measured. The descriptions and prime cost values of special items, as gaseliers, sun-burners, &c., should be inserted in the specification by the architect.

Make an item for paying the fees to the gas company for opening the ground and tapping the main; and any excavation beyond this, where intended to be executed by the builder, should be measured by the foot run, and the depth stated. An item is also made for cutting away for, attending upon, and making good after this trade.

TABLE X.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Welded gas-tubing (according to size, stating the diameter of the bore of the pipe)	At per foot run.
Bends, elbows, tees, crosses, sockets, outlets, extra to outlets, stating diameter of bore in each case ..	At per number.
NOTE.—Each of these items must be specified separately in the "Bill."	
Stop-cocks and brass spanners, stating size and description	At per number.
Gas meters, stating number of lights it is to supply, and description	”
Gas pillars, brackets, pendants, &c., according to description	”
Star-burners, and sun-burners, according to description	”
Pay gas company's fee for opening ground and tapping main	”
Allow for cutting away for, attending upon, and making good after gasfitter in all trades	”

BELLHANGER.

The description of the bellhanging is generally taken directly from the specification, stating the number and description of the bells, and the various parts of the house from whence they are rung, and their positions; also stating whether the wire is intended to be concealed in secret tubes; if so, whether zinc or copper; and the description and quality of the pulls. This item would include all cranks, wire, &c.; but a separate item must be taken for the attendance of the other trades in cutting away, &c., and making good. Such is the customary mode of dealing with the bellhanger, the cost of wire being so slight, that a few feet more or less make no perceptible difference in the estimate, and surveyors, as a rule, do not think it necessary to measure it. A general description of the bells should preface the bill, as shown in the accompanying Table:—

TABLE XI.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

The whole of the bells are to be hung in concealed zinc tubes, with best cranks and wire, in the best manner, and all to have pendulums and labels.

Crank pulls on third floor, to ring to bell on ground floor	At per number.
Lever pulls with white and gold china furniture on first floor, to ring to bell on ground floor	„
Call-bells and brass slides on ground floor, to ring on third floor	„
Bronzed sunk and dished pulls, 6 in. diameter, and fixing at entrance, engraved "Visitors," to ring one bell on ground floor	„
Bronze draw-out pull, and fixing at entrance	„
Allow for cutting away, for attending upon, and making good after, bellhanger	„

Where the surveyor prefers to take the several items separately, the following is the method of measurement:

Copper wire	At per yard run.
Tubing (zinc or copper)	At per foot run.
Cranks (with description)	At per number.
Pulls „	„
Bells „	„
Attendance, &c., as before	„

Electric bells are generally charged for at per pull, and the indicating bell numbered. Indicator boxes at per indicator, according to description; and batteries are taken at per cell, stating the description of the battery.

CHAPTER IX.

PLASTERER.

COMMENCEMENT — EXTERNAL WORK — DEDUCTIONS FROM — ADDITIONS TO—LABOUR—REVEALS—CORNICES, ARCHITRAVES, &C.—ENRICHMENTS—BEADS AND QUIRKS—COLUMNS, PILASTERS, &C. — FLUTING — STRINGS, &C. — BALUSTERS — CHIMNEY-POTS — RENDERING—INSIDE WORK—CEILINGS—EXAMPLE OF—DEDUCTIONS—ADDITIONS—LATH AND PLASTER—WHITENING—EXTRA TO—PANELS—CENTRE FLOWERS—SOFFITS—CORNICES—EXAMPLE OF—ENRICHMENT TO—FRIEZES—RENDERING TO WALLS—ANGLES—BEADS AND QUIRKS—CIRCULAR LATHING AND PLASTERING TO PARTITIONS — MOULDINGS AND ARCHITRAVES — CEMENT SKIRTINGS—CEMENT FLOORS—CEMENT HEARTHS—LIMEWHITING, COLOURING, DISTEMPERING, &C.—TABLE OF WORK.

IN the admeasurement of plasterers' work, it is advisable to adopt the course already prescribed, namely, to take floor by floor, completing one floor before the other is commenced. In this case, however, the rule is applicable only to inside work; that to outside being taken on the entire surface. Read carefully the specification, and keep the different descriptions of cement separate. Commence then with the *external work.*

EXTERIOR:—Measure the entire portion covered, taking the length by the height, including all projections for set-offs, plinths, strings, &c., and also the returns, so as to arrive at the entire area. Make all the deductions as they occur for openings, &c. Describe the nature of the workmanship and quality of the material. State whether laid on brick or on laths, and whether jointed to imitate stone. It is recommended that all additions be taken before any deductions appear in the Dimension-book or paper, as by adding and subtracting these items the total area can be brought into abstract in one item, thus effecting a saving of time, and producing less complication. The total is afterwards reduced to the yard superficial, and billed accordingly, as shown hereafter in the Table. Having disposed of the superficial area, take a running dimension of the arrises or angles, additional labour being necessary to obtain a clean, sharp angle, and abstract and bill it accordingly. Labour to beads and quirks is also measured by the foot run. Take all reveals and soffits, and other work, where executed in narrow widths, by the foot superficial.

Cornices, Architraves, &c., are measured by the foot superficial, taking the length by the girth; number all mitres, stopped ends, and returns, stating in each case the girth of the mouldings to which they relate, all cornices under 6 in. girth are measured by the foot run. Take the enrichments by the foot run, stating the girth, and giving sketch in explanation, also numbering the mitres and stops to the same. All mouldings, architraves, &c., above 6 in. girth are measured by the foot superficial, taking the extreme length by the girth, as shown in Fig. 21, p. 55, *ante;* where under that girth, by the foot run; number all mitres, stops, and returns, stating in each case the girth as before. Take all beads and quirks by the foot run, and number the mitres and stops.

Columns, Pilasters, &c.—Plain work, &c., to columns, is measured by the yard superficial, and described as circular work to columns, the mouldings to necking and base being measured as already stated, but described as circular. Number the caps, and give a sketch showing what is intended, and also figure on it the height of the cap, and the upper and lower diameters. Pilasters are measured by the foot superficial. Take a running dimension of the arris, and also of the neck and base mouldings when under 6 in. girth; number the mitres. Number the cap, and give sketch and figure dimensions. Take any fluting to pilasters and columns by the foot run, stating whether diminished, and number the semicircular stoppings to ditto.

Strings, &c.—Floriated moulded strings and parapets, &c., &c., are measured by the foot run, giving sketches and dimensions for the different descriptions of work.

Balusters are numbered, giving sketch and dimensions.

Chimney-pots are numbered, stating dimensions, and, when out of the ordinary, giving sketch.

Rendering to inside of parapets, &c., is measured by the yard superficial, as shown in the Table.

INSIDE WORK.—In measuring inside work, adopt the same course throughout each room; commence at the bottom of the house, and take floor by floor as already stated. Proceed to measure the ceilings firstly, then take the cornices, and then the walls; and lastly, whatever else remains, as skirtings, &c. Measure the ceilings the full dimensions between the walls; but where cornices occur, it is customary to make a deduction of the width of the cornice upon each dimension for width and length of ceiling. This is done on "Waste." Presuming the room to be 20 ft. long and 16 ft. wide between the walls, and a cornice run round the room, projecting from the face of the wall 12 in., this would appear in the Dimension-book as follows:—

Length	20·0
Less cornice	1·0
Net length..	19·0
Width	16·0
Less cornice	1·0
Net width	15·0

19·0 15·0	285·0	Lath, plaster, float, and set ceiling.

Make the deductions for chimney breasts, &c., and also any additions that may occur. Refer to specification for description of the work, and state the same fully in the quantities, whether lath and plaster one coat; ditto one coat and set; lath, plaster, float, and set; or as the case may be. Some surveyors take the sizing and whitening to ceiling, and include it in the one dimension, thus:—

19·0 15·0	285·0	Lath, plaster, float, set, and twice whiten ceiling.

This, of course, is quite optional; but undoubtedly it effects a little saving of time, though the dimension for whitening ceilings would simply be a repetition of that for plastering.

Where elaborate ceilings occur, it is customary to measure such elaborations as "extra" to the ordinary work, and to take the same by the foot superficial, as, for example, to raised panels.

Panels.—Take mouldings to panels by the foot run, stating the girth; number the labour to mitres, stoppings, &c. Also number pateras and centre flowers; and in the latter cases it is recommended that architects should always affix a p. c. value in the specification, as it is almost impossible to give sketch; and in very few cases are details sufficiently far advanced to include the centre flowers; and as also in many cases they are selected, this will be the more apparent.

Soffits to stairs are measured in the same manner as already described to ceilings, although they must be kept separate from the ceilings, as hereafter shown.

Cornices are measured the length by the girth, and where the latter exceeds 6 in. they are taken superficially; under that girth they are, however, measured and billed at per foot run. To obtain the average length of cornice take the full dimension between walls for the lengths of two sides, and the net length between the nose of the cornices for the other. These should be collected on "Waste," thus taking the case already given (cornice 1 ft. projection, 18 in. girth), we have:

Length of room between walls ..	20·0
Ditto	20·0
Net length between cornice ..	15·0
Ditto	15·0
	70·0

70·0 1·6	105·0	Plaster moulded cornice.

Or the length may be arrived at by taking the round of the walls and deducting twice the projection of the cornice, thus:—

	20·0
	20·0
	16·0
	16·0
Round of walls	72·0
Twice projection of cornice.. ..	2·0
	70·0

Make the additions and deductions as they occur. Number all the mitres, and state the girth, and keep the external and internal angles separate. Also number the stopped or returned ends, stating girth as before. Enrichments to cornices are measured by the foot run, stating girth, and also whether undercut. The mitred angles and stopped ends to enrichments to be taken and numbered as described to cornice.

Friezes are measured the length by the width, and valued by the foot superficial, any enrichments being taken, as already described to cornices.

Rendering to walls is measured the length by the height, the latter being taken from the top of the skirting grounds to the ceiling, and where there is a cornice it is customary to deduct from this dimension half the height of the cornice. The lengths of the several walls of each department can be collected on "Waste," and brought forward in one dimension if preferred. Make the additions and deductions where they occur. In the case of deductions for doors and windows, take the full dimensions for length and height to the outside of the grounds, and not the net dimensions. In the case of doors, the height, where there is a skirting, must be taken from the top of skirting grounds, and not from the floor. State the nature of the wall and the number of coats, whether floated and set, &c., &c. Where the angles are described to be executed in Keene's or other patent cement, measure the same by the foot run, taking the length as already stated to walls, and describing as "*extra* to Keene's cement angle," or as the case may be.

Beads and quirks are measured in a similar manner.

If any of the foregoing work is executed on a circular surface, it must be so stated, and be kept separate from the straight work.

Lathing and plastering to partitions follows rendering to walls, and is measured in a similar manner, with the exception that where cornices occur it is customary to deduct only one-third the depth of cornice from the height, instead of one-half as described to walls. Make the additions and also the deductions as stated to walls, and keep any circular work separate from the straight. Describe the nature of the work, whether lath and plaster one coat; lath and plaster two coats; lath, plaster, float, and set, &c., &c. Where the work is executed in narrow widths, as to jambs, soffits, &c., it should be measured by the foot superficial and kept separate. This applies also to rendering to walls.

Measure all mouldings and architraves as already described to external work.

Cement Skirtings.—Take the lengths and collect the same on Waste. State the height, and they are afterwards reduced and valued by the foot superficial. Where the skirtings are moulded, instead of the net height take the girth from floor to face of plastering of wall. Number all the angles and state the nature of the work.

Cement Floors are measured by the yard superficial, and the nature of the work described, also the quality of the material.

Cement hearths are measured by the foot superficial.

Limewhiting, Colouring, Whitening, Distempering, &c., are measured by the yard superficial. Take the dimensions of the several walls, collecting the lengths on "Waste" of all walls of equal height, so as to bring forward in one dimension. Make the additions where they occur, and also all deductions for door and window openings, fire-places, &c. Take the cornices by the foot run, and state the girth, and where enriched, state the number of members and tints. It may be observed that most of the dimensions for this work can be taken from the dimensions for plastering.

TABLE XII.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

EXTERNALLY.

Portland Cement.	
Plain face on brick	Per yard super.
Ditto, jointed	"
Ditto, circular	"
Ditto, to fascias, pilasters, reveals, &c...	Per foot super.
Ditto, in weathering	"
Plain mouldings	"
Ditto, circular	"

Arris	**Per foot run.**
Bead and quirk	„
Flutes to columns	„
Ditto, diminished	„
Mouldings under 6 in. girth	„
Stops to mouldings	At per number.
Returns to 6 in. ditto	„
Mitres to 9 in. ditto	„
Intersecting mitres to ditto, ditto	„
Enriched and floriated strings, cornices, &c., &c. (stating height and giving sketch showing nature of work)	At per foot run.
Stopped ends to ditto	At per number.
Angles	„
Ornamental parapets, including all dubbing out, &c. (giving dimensions and sketches as before)	At per foot run.
Moulded trusses, ditto, ditto	At per number.
Caps to pilasters, including mitres and returns, ditto, ditto	„
Ditto to columns (giving sketch and height and upper and lower diameters)	„
Rough rendering to back of parapets, &c.	At per yard super.

INTERNAL WORK.

Render, one coat	At per yard super.
Ditto, two coats and set	„
Ditto, float and set	„
Ditto, to jambs, and in narrow widths	At per foot super.
Ditto, circular	„
Lathing	At per yard super.
Lath and plaster, one coat	„
Ditto, ditto, one coat and set	„
Ditto, ditto, two coats and set	„
Ditto, ditto, float and set	„
Ditto, ditto, to groins	„
Lath, plaster, float, set, and twice whiten ceilings	„
Ditto, ditto, soffits of stairs	„
Plain mouldings	At per foot super.
Mitres to 8 in. moulding	At per number.
Stoppings	„
Enrichments (stating girth and giving sketch)	At per foot run.
Mitres to 6 in. enrichment	At per number.
Stops to ditto	„
Keene's cement angle	At per foot run.
Bead and quirk	„
Ditto and double quirk	„
Ditto, ditto, circular	„
Mitres	At per number.
Stops	„
Stops to splay	„
Ditto, moulding	„

Pateras 6 in. diameter, p. c. 2*s.*	At per number.
Centre flowers, 30 in. diameter, p. c. 30*s.*	"
Portland Cement flooring (stating thickness)	At per yard super.
Ditto, hearths (ditto)	At per foot run.
Twice limewhiting	At per yard super.
Ditto, colouring	"
Washing, stopping, and whitening	"
Ditto, distempering to approved tint	"
Ditto, ditto, cornices	At per foot super.
Ditto, ditto, enrichments, picked out 4 in. girth in tints	At per foot run.

CHAPTER X.

PLUMBER.

EASY TO MEASURE—DIFFICULT TO PRICE—MILLED OR SHEET LEAD—WHERE TO COMMENCE—ABSTRACTING—FLATS—EXAMPLE OF—DRIPS—ENDS TO ROLLS—FLASHINGS TO—GUTTERS—CESSPOOLS—COVERINGS TO DORMERS, CHEEKS, APRONS, &C.—FLASHINGS—POINTING TO—ABSTRACTING—FINIALS—CISTERNS—SINKS—NAILING—PIPES—BRASS WORK TO—W. C. APPARATUS—SOIL PIPES—SERVICE BOXES—PUMPS—LAVATORIES AND URINALS—TABLE OF WORK—ZINC-WORKER—DIFFERENCE FROM LEADWORK—GUTTERS—RAIN-WATER PIPES—HEADS, &C.—TALLBOYS—VENTILATORS—SKYLIGHTS—METAL LIGHTS—SPEAKING PIPES—TABLE OF WORK.

THE admeasurement of plumbers' work, whilst perhaps more simple than that of the trades of which I have already treated, requires a greater degree of care in taking the dimensions, as, owing to the expensive nature of the material and labour, an error which might appear at first sight to be small, frequently turns out to be extensive. In all cases take the exact dimensions of the several items, making no allowances whatever.

It may be as well to observe here that, whilst comparatively easy to the quantity surveyor to take off the quantities and measure up the work appertaining to plumbing, it is more difficult for a builder to estimate the same, owing to the peculiar circumstances under which the work may be executed varying in almost every job; the labour in fixing pipes depending upon the situation of the several cisterns, sinks, &c., and the construction of the different parts of the building—in some cases entailing considerably more cutting away and making good than in others—and as in some cases the builders do not even know in what portion of the building some of the connections are to be made, the force of this remark becomes the more apparent.

Milled or Sheet Lead.—Sheet lead is measured by the foot super, and reduced afterwards to weight; the specification stating the quality of the material—as 5 lb., 6 lb., or 7 lb. to the foot superficial—and, of course, by multiplying the superficial area of the lead by the number of lb. to the foot, we arrive at the total weight.

In "measuring up" it is generally advisable to gauge the lead to ascertain the weight, when the builder is not to be depended upon, and the architect is uncertain as to whether the quality specified has been laid, though this course is seldom pursued.

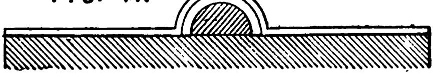
Preparatory to its being laid, however, the architect should invariably have a sample (one foot super) cut off, and thus ascertain whether it contains the weight stated in the specification.

Commence by measuring the leadwork to roof, taking, firstly, any flats, then the gutters, and lastly, the flashings.

In abstracting, head a separate column for each of the different qualities of lead.

In flats take the extreme dimensions each way; but when out of the square take the average, so as to obtain the net area. Include all turnings up, drips, and rolls; in the latter case the amount to add to the width would be, in a properly constructed roll, as shown in Fig. 41, twice the circumference of the roll, less the net width of the same. This would give about 9 inches wide, and supposing the net size of the flat to be 12 feet × 10½ feet, and there are five rolls running the lengthways of the flat,

FIG. 41.



which is turned up each way 6 inches, the items would appear in the Dimension-book as follows:—

	′ ″
Length	12·0
Turns up 2/6 in. ..	1·0
	13·0
Width	10·0
Rolls 5 in.	3·9
Turns up 2/6 in. ..	1·0
	14·9

′ ″	′ ′	
13·0 14·9	191·9	6 lb. milled lead in flat.

Where drips occur, add the width of the same to the length or breadth, as the case may be, on "Waste," so as to bring the whole flat forward in one dimension.

Number the bossed and soldered ends to rolls, and the extra labour in forming any cesspools in flats, in which case it will also be necessary to take outlet or socket pipes for communication of rain water from flat to downpipe. These are also numbered, stating size and length.

Collect the round of the walls for the flashing, on "Waste," adding for the laps at the angles, for the length; state the width, and the quality of the material, which is generally of less weight per foot than that to the flat. Then reduce the item to the foot superficial.

In measuring gutters, take the entire length, adding for laps and turns up, and the sum of these by the average width will give the area. It is always advisable to show how the whole of the dimensions are arrived at on "Waste." Number cesspools and outlet pipes as before.

Coverings to dormers, cheeks, aprons, &c., are all measured by the foot superficial, including all laps, &c. Hips and ridges are also measured in this way.

Flashings, where stepped, must be kept separate from the going in the bill, and when against stone it is necessary to take a separate item for "burning in flashing," which would be simply a running dimension, stating the length.

Pointing to flashing is measured with the bricklayer, as stated therein.

After abstracting the sheet lead, it is brought into bill by multiplying the area by the weight of the lead per foot; thus, supposing the area of 6 lb. lead to be 150 feet, this would equal 900 lb. or 8 cwt. 0 qrs. 4 lb., to which should be added the weight of the 5 lb. and 7 lb. lead, if any, ascertained in a similar way, and the whole brought into bill in one item.

Leadwork in dressing to finials is measured in with the foregoing, and where extra labour is required, it is expressed as "extra labour and solder in dressing lead round moulded base of finial 12 inches × 12 inches, and 16 inches high, as sketch," or as case may be, giving sketch where necessary.

Leadwork to cisterns and sinks is kept separate from the foregoing in the bill, as shown in the Table, but measured in a similar manner, taking care to add all laps, &c. Take a running dimension of soldering to angles, and also of nailing, stating, whether lead-headed or copper nailing, and whether laid closely or otherwise. Number the standing waste, and state whether trumpet mouthed; also number washer and waste, and all other brasswork hereafter described.

Pipes and Brasswork.—Lead pipes are measured by the foot run, and would be easier billed in this way, though many surveyors prefer to bill them as they are sold, viz. by weight. State the sizes and quality where taken at per foot run; also mention whether including all joints, &c., &c., although it is better to number the same as extra, which, by the by, is seldom done. Number all cocks, stating sizes and giving full description, whether rivet or screw bottom, and if with screw bosses, &c., &c. Be particular to state whether stop, bib, or ball cocks, and if the latter, do not omit the balls, stating whether copper or zinc.

Also number all washers, plugs, unions, traps, gratings, giving size and full description in each case.

W. C. Apparatus.—The w. c. apparatus is generally numbered complete, giving full description of the quality of the different parts, if with white or blue basin, patent valves, brass, flat, or sunk plate, &c., &c., and if patent closets, give name of patentee, and p. c. value of the same. Number the D traps, and take any soil pipes by the foot run, stating the diameter and the weight of the lead it is made of per foot superficial. Number the joints, and take extra labour in forming any elbows or bends. Also number all service boxes.

Pumps.—Pumps are numbered, stating description and p. c. value, exclusive of fixing, the builder adding cost of carriage, profit, and fixing complete.

Lavatories, &c.—Lavatories and urinals are also numbered and described, the brasswork and pipes being taken separately as previously described.

Table XIII.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Milled lead, and labour in gutters, flat, flashings, &c., including all solder, wall hooks, &c., complete ..	At per cwt.
Ditto in step flashings	"
Ditto in linings to cisterns, sinks, &c.	"
Close copper nailing	At per foot run.
Zinc nailing	"
¾ in. strong drawn lead pipe (— lbs. per foot and fixing)	"
Joints to ¾ in. pipe	At per number.
(Here follow other diameters of pipes, stating smallest first, and giving weight per foot run in each case.)	
4 in. lead soil pipe out of 7 lb. lead and fixing	At per foot run.
Joints to ditto	At per number.
Elbows to ditto (extra only)	"
Trumpet-mouthed standing waste, 2 ft. 6 in. long ..	"
Brass washer and waste (stating size)	"
Ditto, with fly nuts for slate cisterns (ditto)	"
Lead bell-traps with brass grates (ditto)	"
Brass unions for lead pipe (ditto)	"
Barrel ditto, screwed for iron pipe (ditto)	"
Brass washer, plug, and chain (ditto)	"
Brass stop-cock, screw bottom with brass spanner (ditto)	"
Ditto, bib-cock, screw bottom and boss (ditto)	"
Ditto, ball-cock, screw bottom and boss, and copper ball (ditto)	"
Ditto, equilibrium ball valves and copper balls (ditto)	"
Ditto, high-pressure diaphragm stop-valves (ditto) ..	"
ls of rolls, bossed and soldered	"

Extra to forming cesspools	At per number.
3 in. lead outlet pipes and soldering (stating length)	”
Full-sized bright pan closet, with copper fan, round valve, ball lever, cranks, and copper wire	”
Ditto pan closet, with supply valve, and Underhay's patent regulator, sunk dish and blue basin	”
Elastic valve closet, with supply valve, and Underhay's regulator, sunk dish with cut glass handle, blue basin	”
Lead D traps	”
Ditto service boxes	”
Wash-hand basins and lavatories (stating size) and description	”
Urinals (ditto)	”

ZINC-WORKER.

The measurement of zincwork is so very similar to that of plumbers' work, that the following remarks will suffice. The difference is that whereas leadwork is valued by weight, zinc is charged by the foot superficial, the different qualities of the material being specified by numerals. In billing, therefore, it is necessary to specify the number of the gauge of the zinc, and any other observations which it may be requisite to state in regard to the workmanship.

The following articles, which I have not described in the Plumber, I will briefly enumerate here. Gutter and rain-water pipes are measured by the foot run, stating the sizes in each case, and the description. Number the stopped ends and outlets to gutters, and the heads and shoes to rain-water pipes, also the ears, swan-necks, &c., &c., giving sizes and descriptions where required.

Zinc tallboys, ventilators, and other similar items are numbered.

Zinc skylights are generally valued at per foot superficial, extra being charged for sliding or other ventilators in the same.

Metal lights are also measured by the foot superficial. It is necessary that a full description should be given, stating whether plain or ornamental.

Speaking pipes are measured by the foot run, numbering all elbows as extra only: also numbering all mouthpieces, whistles, &c., and giving description.

TABLE XIV.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Malleable zinc in flats, &c., including all labour, No. 13 gauge	Per foot superficial.
Ditto in gutters. No. 12	"
4 in. O. G. gutter	At per foot run.
Stopped ends	At per number.
Outlets	"
3 in. rain-water pipe	At per foot run.
Square heads	At per number.
Shoes	"
Ears	"
Ventilators (giving description)	"
Tallboys (giving description)	"
Metal lights (ditto)	"
Speaking tube	At per foot run.
Extra to elbows	At per number.
Flexible tube	At per foot run.
Mouthpieces	At per number.
Whistles and chains	"

CHAPTER XI.

PAINTER.

COMMENCEMENT—STAIRCASE—SOME SURVEYORS ALLOW FOR—CUT IN—HOW BILLED—SASHES AND FRAMES—CASEMENT FRAMES—STONE SILLS—PLINTHS, CORNICES, &C.—GUTTERING—RAIN-WATER PIPES—CRESTING—RAILINGS—GATES—BALCONIES, &C.—DOOR-KNOCKERS, &C.—INSIDE WORK—HOW TO MEASURE—WINDOWS—WINDOW BACK—PANELS—BOXING SHUTTERS—SKIRTINGS—DADOS—DOORS AND LININGS—STRINGS—BALUSTERS, HANDRAILS, AND NEWELS—KNOTTING AND STOPPING—MOULDINGS CUT IN—COMMON COLOURS—GRAINED WORK—STAINING—TABLE OF WORK—FRENCH POLISHER—WRITER—GILDER—TABLE OF WORK.

ADOPT the same systematic method in taking off the painters' work as recommended to the other trades. Take firstly the outside work. In proceeding with the inside, complete one floor before commencing a second, and take the staircase last. Many of the dimensions will be the same as those of the joiner, and may be taken therefrom. In some cases where the surveyor is hurried, he neglects to measure the painting at all, but takes the superficial quantity of work to be painted from the joiner's bill, and adds thereto one-seventh of the total as an allowance for the edges. In small matters, where the work executed is very ordinary, the difference between this course and the correct way would be slight, owing to the price per yard for painting being inconsiderable, but in first-class work, or where there is a large quantity of painting required, it is not to be tolerated. I do not recommend it in any case. Measure the entire surface covered by the brush; that is, including all rebates, sinkings, &c., and taking the girth of the mouldings as shown in Fig. 35, page 82, *ante*. Where the work has to be "cut in on both edges," that is, worked to a line as in the case of skirtings, &c., additional labour is involved, and the customary rule is to measure this description of work by the foot run.

Paintwork in general is measured by the foot superficial, which is afterwards reduced to the yard superficial, and billed accordingly. Lineal dimensions are billed at per foot. The following is the customary method of measuring the various items for painting, and the order recommended for taking them:—

Outside Work.—Sash frames and sashes are numbered, and the sash squares are afterwards reduced and billed at per dozen, as shown in the Table, stating whether large or small squares. Casement frames are also numbered, and it will be necessary to state the number of lights, whether two, three, four, or six light casement, or as the case may be; also, if large it must be so specified, and this will apply equally to sash frames. By "large," is meant anything beyond the ordinary sizes. Cement fronts are measured by the yard superficial. Stone sills are numbered. Reveals and soffits to the windows would be measured by the foot run, except where the front is of cement, in which case it would be measured with and as the front. Measure plinths, string courses, cornices, copings, &c., in a similar manner, and where done from ladders or scaffolding the work must be kept separate from the general item for painting in the bill, and described according to the manner in which it is executed. Eaves guttering is measured by the foot run, and the stopped ends, clips, outlet pipes, swan-necks, &c., numbered. Rain-water pipes are also measured by the foot run, numbering the heads, stating whether ornamental or otherwise; also the shoes, ears, &c., &c. Iron cresting is measured by the foot run, and all finials numbered, and iron railings are measured by the yard superficial; as are also gates, ornamental railings, balconies, balconettes, &c. Door-knockers, knobs, scrapers, and other items of a similar nature are numbered.

Inside Work.—Having completed the outside, proceed to the inside. It is advisable to observe the following rule in measuring framed and other works, namely;—to measure all projections for panels, mouldings, &c., in the dimension for the height only, and all returns in that for the width. Keeping this in mind, the work is tolerably easy.

Sashes and Frames, &c.—Measure firstly the windows, taking *the width from* out to out, that is, from the edge of one architrave *moulding,* to that of the other, and add the two returns against the wall; for the height, take from the under side of window board to the top of architrave, exclusive of the returns to wall. If, however, there is a window back, take the dimension for the height from the floor. It will be necessary to add to this dimension the allowances for projections and mouldings in panels, &c., whatever the girth exceeds the flat, but, as I have just stated, not the returns. In ordinary square framed panels the allowance for each panel is one inch.

Boxing Shutters, &c., are measured the width by the height. For the width take the width across the window, and add to this 2 feet 6 inches, to allow for the edges and the inside of boxings, &c. The height would be obtained in the way already mentioned. The lengths for back linings should be collected on Waste and taken in one dimension; this by the width will give the area. The elbows are measured the width by the height, adding to the latter for any panels, &c., as before. These remarks will also apply to back flaps, and sliding shutters, which are all measured in the same way. In the latter case do not omit the flap. The sash squares are numbered as described to outside, and shutter bars are also numbered.

Skirtings are measured by the foot run, the length by the girth, from floor line to wall line.

Dados are measured by the yard superficial, the length by the height, adding to the latter for the projections and whatever the girth of the mouldings exceeds the flat surface of the same.

Doors and Linings.—In measuring doors take the width of the door, including grounds and architrave, adding whatever the returns measure. For the height take from the floor to the top of the architrave, and add for the extra to the girth of the architrave, and also for the panels, but not the returns. The jamb linings are measured the total length, that is, twice the height of the door *plus* the length of the soffit, by the width of the lining *plus* the thickness of the door (for the edges of the same) and the width of the rebate.

Strings to staircases are taken as described to other work where cut in on both edges, that is, by the foot run. Balusters, handrail, and newels are taken by the foot run. Ornamental iron balusters and newels should be numbered.

I think sufficient has been written to show my readers how this description of work should be measured. Of course it will be necessary to keep the works differently treated separate, stating in each case the number of oils in which it is to be painted, also if knotting and stopping are included, which in new work would be the case. If flatted, take the flatting coat as extra, and where the painting is to be finished in ornamental colours, take the latter as extra; specify the tint. I give an example in the Table. Where mouldings are "cut in" in party colours they are measured by the foot run, as extra to the framing. By the common colours are understood the ochres, umbers, Venetian red, lamp-black, red-lead, and Spanish brown.

GRAINED WORK is measured as extra to the painting, by which is meant that the work having been already measured for the painting, the item is taken again for the extra price for graining. It is measured in precisely the same manner as described to paintwork. State the nature of the imitation, whether wainscot, pollard oak, mahogany, bird's-eye maple, &c., and the quality and number of coats of varnish to be applied.

STAINING is also measured in the same way as paintwork, specifying the stain, and coats of varnish as before.

FRENCH POLISHING is measured as shown in the accompanying Table. It is customarily taken off with the Joiner, thus preventing the possibility of its omission, which otherwise might be the case. It is also generally included in the "bill" with the item to which it relates, consequently a separate bill is not made. I have thought it best to call attention to it in the manner shown.

TABLE XV.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

—— times in oil on woodwork	At per yard super.
Ditto on cement	"
Ornamental railings, gates, &c., both sides..	"
Skylights	"
Carved work	At per foot super.
Skirting 12 in. girth and under	At per foot run.
Strings	"
Chair-rail	"

Handrail	At per foot run.
Balusters	„
Newels	„
Rain-water pipes	„
Ornamental heads	At per number.
Ears	„
Shoes	„
Eaves gutter	At per foot run.
Stopped ends ditto	At per number.
Outlets ditto	„
Swan-necks ditto	„
Cement reveals	At per foot run.
Cornices under girth	„
Window sills	„
Coping edge	„
Stone strings	„
Stone plinths	„
Iron cresting	„
Guard bars	„
Sash frames	At per number.
Small ditto	„
Two-light casement frames	„
Four ditto ditto	„
Sash squares	At per dozen.
Brackets	At per number.
Quatrefoils	„
Finials	„
Step-ladder	„
Dresser	„
Chimney-pieces	„
Scrapers	„
Extra to flatting to chosen tint	At per yard super.
Four oils and extra finished French grey	„

GRAINER.

Extra grain in imitation wainscot and twice varnish	„
Ditto enrichments in panels 4 in. wide	At per foot run.

STAINER.

Staining to an approved tint and twice varnishing with the best copal varnish	At per foot super

FRENCH POLISHER.

French polishing	At per foot super.
Ditto to handrails, &c.	At per foot run.

WRITER.

Writing is measured by the inch run, stating the height of the letters. Specify whether painted simply plain, or if shaded, double shaded, or gilt letters, &c., &c. If the writing is to be executed on a glazed surface it must be so stated, the price being considerably in advance of the ordinary for that description of work. It is also necessary to state the style of writing required, whether Egyptian, Old English, Antique, &c., &c. Work other than the foregoing is charged at special prices.

WRITER.

Ordinary style, stating height. *Note.* This style includes Egyptian, Old English, and German Text	At per inch run.
Ornamental style, stating height as above. *Note.* This style includes Antique and all others not included in the first item	"

GILDER.

The following Table will explain the method of measuring gilder's work:—

TABLE XVI.

Gilding on flat surface	At per foot super.
Ditto on carved work, stating height and description	At per foot run.
Moulded work, stating girth	"
Beads, &c., ditto	"
Carved caps	At per number.
Bosses and single items of similar nature	"

CHAPTER XII.

GLAZIER.

WORK, HOW MEASURED—BILLED—SEMICIRCULAR SHEETS—BENT GLASS—COLOURED OR EMBOSSED GLASS—CUTTING TO SEGMENTAL HEADS—LEAD LIGHTS—TRACERY—GLASS TILES AND SLATES—TABLE OF WORK.

THE measurement of glaziers' work is as follows. Take the extreme dimensions in every case between the rebates, and make no deductions for irregular surfaces. All fractional parts of an inch are to be taken as full inches in each of the dimensions. State the description and quality of the glass, and keep the different descriptions separate; also keep separate and state the superficial area of each of the squares where they exceed 3 feet, as illustrated in the following Table, stating, firstly, that under 3 feet super in a square, then that under 4 feet, and so on. Also take the glass in the order shown therein, namely, the inferior description firstly, and so on, to the best, though this course is dependent upon circumstances. Where so taken, however, the whole of each description of glass can be abstracted in one item; and, in many cases, an abstract can be dispensed with, and the quantities billed direct from the dimensions. Measure *semicircular sheets* as if square, taking the largest dimensions for length and height.

Glass bent to a given radius, and to elliptical or other curves, or both ways of the glass, must be kept separate, and described accordingly. Coloured or embossed glass is measured by the foot superficial, the margins being taken by the foot run, and the corners enumerated, stating the sizes.

Take *cutting* to segmental heads by the foot run; and in the case of cuttings to small quadrant corners, it is best to number them.

I think the reader will find the Table sufficiently explicit to need no further explanation here.

I would mention, in conclusion, that glazing in lead lights must be specified separately, and fully described, stating the sizes of the squares, or the prime cost value of the whole per foot super. Number all spandrels in tracery heads, stating the extreme dimensions, including all cutting, and stating whether trefoils, quatrefoils, &c. &c.; and, if irregular shapes, giving sketches. I have given a specimen of this description at the end of the Table.

Glass tiles and slates are numbered, stating the sizes and thicknesses.

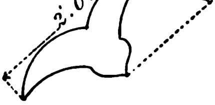
Table XVII.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

21 oz. sheet glass, under 3 ft. super in a square	At per ft. super.
32 oz. ditto ditto, under 4 ft. super in a square	"
Ditto ditto, under 6 ft. super in a square	"
16 oz. obscured sheet glass, under 3 ft. super ditto ..	"
Ditto fluted ditto ditto	"
Hartley's patent rolled plate glass, $\frac{1}{8}$ in. thick, under 5 ft. super in a square	At per ft. super.
⅜ in. rough plate glass in 6 in. widths, and glazing in iron grating	"
21 oz. best patent plate glass, under 12 ft. super in a square	"
Best British plate $\frac{3}{16}$ in. thick, under 10 ft. super in a square	"
Ditto ditto, under 12 ft. super in a square	"
Ditto ditto, bent to 3 ft. radius, under 4 ft. super in a square	"
Ditto ditto, ground and embossed to design, under 6 ft. super in a square	"
Cutting to semicircular or segmented heads	At per foot run.
Small quadrant cuttings	At per number.

The following is the customary method of measuring church windows.

FIG. 42



Cathedral glass and glazing in strong lead quarry lights, with narrow diapered margins of prime cost value of per foot super.	At per ft. super.
Spandrels 8 in. × 6 in. extreme size, glazed as above in tracery heads	At per number.
Ditto 2 ft. × 8 in., ditto as sketch	"
Trefoils 18 in. × 12 in., ditto ditto	"
Quatrefoils 30 in. × 30 in., ditto ditto	"

CHAPTER XIII.

PAPERHANGER.

METHOD OF FINDING NUMBER OF PIECES OF PAPER—PREPARING WALLS—BORDERS AND HANGINGS—TABLE OF WORK.

THE measurement of paperhangers' work is fully shown in the following table. Take the lengths and heights of walls, making the several deductions for doors, windows, fireplaces, &c., and bring to the foot superficial. By dividing the product by 60, the number of superficial feet in one piece of paper, we obtain the number of pieces required for the different apartments. All portions of a piece are to be taken as full pieces; that is, the number of odd feet remaining of the various descriptions. Preparing walls for paper is measured in a similar manner to the foregoing. It may be observed that most of the dimensions for the foregoing can be obtained from those of the plastering, and that for preparing walls will be, of course, simply the addition of the total number of pieces of paper hung.

Measure all borders and hanging, by the dozen yards lineal.

TABLE XVIII.

This Table has a double use; it shows the order of taking this Trade, and the method of Measurement.

Paper of p. c. value of 1*s*. per piece, and hanging same	At per piece.
Ditto ditto, p. c. value 2*s*. per piece, and ditto ..	"
Ditto ditto lining paper and ditto	"
Marble paper p. c. value 2*s*. 6*d*. per piece, sizing and twice varnishing in best copal varnish	"
Preparing walls for paper	"
Border p. c. 1*s*., and hanging same	At per doz. yards run.

CHAPTER XIV.

ABSTRACTING AND BILLING.

USUALLY DONE BY JUNIORS—ORDER OF ITEMS IN ABSTRACT—DIRECTIONS AS TO ABSTRACTING—CUBICAL ITEMS—SUPERS—RUNNING—SPACE—BRICKLAYER—CARPENTER AND JOINER—BILLING—DESCRIPTION OF MATERIALS—CONDITIONS OF CONTRACT—INSURANCE—MAINTAINING WORKS—SURVEYORS' CHARGES—COST OF LITHOGRAPHY.

A WORD or two on abstracting and billing the quantities, before bringing my subject to a close. These may appear trivial, when compared to the labour and skill required in "taking off"—and so, indeed, they are. Usually they are placed in the hands of a junior, and to him I will, therefore, particularly address my observations. Many surveyors are very particular as to the manner in which their abstracts are prepared—and rightly so. Any item ought to be as readily found in the abstract as it is in the bill; and it should be so arranged that the items follow each other in the same order as they appear afterwards in the bill, the latter being, of course, merely a *summary* of the former. As I have in my Tables given the order of the various items in each trade, it will be unnecessary for me to recapitulate them here. I can always tell whether a man has had much experience in quantities by the manner in which he prepares his abstract. Items are misplaced, and, owing to a want of forethought and experience, insufficient room has been allotted for their insertion in their proper places. It would be, of course, impossible for me to lay down any specific rule for the guidance of young surveyors, as, of necessity, it must be varied to suit the job; but the following remarks may not be inopportune, and may be applied in every case:—

Glance through the dimensions before commencing the ab to obtain an approximate idea of its nature—that is, of the class of building. If a large, first-class building, the items are likely to be multifarious. Use plenty of paper, and keep the items sufficiently far apart to admit of a few interlineations, which are likely to occur afterwards, where the items are not taken out in regular order.

Take every trade on a separate sheet of paper, except in very small jobs. As a rule, take the cubical items firstly, then the "supers," then the "runs," and lastly the numbered. In each case, those of the least value should be placed first, and the others should follow in order according to their relative values, the most expensive, consequently, appearing last. There is, however, an exception to this, in the case of articles measured at per foot run, which, as in the case of the mason, carpenter, and joiner, are measured in the order of their scantlings in preference to that of their value, those of the smallest scantling being taken first. Also in the case of "supers," articles that are measured by the rod or square are placed in advance of those measured by the foot. The amount of space to be allotted to the various items depends upon the size of the job, and a little experience is therefore necessary. Care should be taken to leave sufficient space to reduce the items to the standard or weight, where such is necessary, as in the case of brickwork, ironwork, &c. I have explained the method of abstracting the bricklayer when speaking of that trade, and I would add that very little difficulty will be experienced in any of the trades where the person has a practical acquaintance with building. The carpenter and joiners' trades are perhaps the most complicated, but with a little experience they are easily overcome, if the student always pursues a certain course, and that I suggest is the one generally adopted, and I think the best.

With respect to "billing," that is, bringing the summary of the dimensions from the abstract into the form of a bill, for the purpose of enabling the builders to price them, this is simple enough. The student has only to copy the various items, in the order in which they appear in the abstract, keeping each trade separate. In a large job, each trade is made a separate bill of, and the total of the estimate carried to a summary; but in a small bill this is seldom the case, the bill being continuous.

It is customary to give a description of the materials to be used in the several trades, before taking the items, such description being taken from the specification. Some, however, prefer to keep them apart from the dimensions, and place them before the quantities; in which case they form a sort of preface.

Conditions of contract are sometimes attached to the quantities, and should, I think, always be so attached. At the end of each trade it is customary to provide an item for "Attending upon the other trades," leaving all clean and perfect at completion, &c., &c. In the summary make provision, where it is required, for "Insurance," "Maintaining works for——months after final certificate of completion," and any other incidentals that may be required, and lastly, but not the least, for surveyor's charges for "taking off" the quantities, and the cost of lithography, &c.

CHAPTER XV.

REPAIRS.

DIFFICULTY OF DEALING WITH PRACTICE OF LUMPING—PIECING STONES—TAKING DOWN WALLS—RENEWAL OF JOINTS—RAKING OUT POINTING—DECAYED STONE—DRAINS AND TRAPS—CHIMNEYS —STOVE BACKS—PAINTWORK—HACKING OUT—IRON FENCING—PAVEMENT—TABLE OF REPARATIONS—MATCHING PAPER—DAY WORK.

THE experienced quantity surveyor is often puzzled when he has to deal with repairs and alterations.

Certainly, compared to new buildings, the difficulties are far greater in old buildings and alterations. Therefore a ready expedient is often resorted to of "lumping," which though in practice is most usually "near the mark," cannot be recommended, for the reason that the object of quantities is to give exactitude, and *not a near approach* to the measurement.

Let me instance a few of the difficulties in this branch of the subject.

1st. Piecing stones or stonework.

2nd. Taking down walls out of the perpendicular, and rebuilding, with all the incidence of scaffolding of a special nature; the using in of some part (what part?) of the old bricks; the making good of disturbed internal work; the making good of the peculiar cornices and skirtings.

3rd. The removal and reinstatement of rotten joists, and the renewal of disturbed ceilings and other parts of the building.

4th. Raking out and pointing portions of the walls, and estimating what scaffolding (if any) will be requisite.

5th. The quantity of labour to repair decayed stone in sinks and other parts.

6th. The reinstatement of drains and traps; the difficulty is great, as so often the stoppage is underground.

7th. The chimneys, chimney-pots, and reinstatement of injury to chimney-pieces.

8th. The money value of reinstatement of stove backs and fronts.

9th. The reinstatement of injured paintwork; what quantity or number of coats is sufficient to make good.

10th. The value of *hacking* out.

11th. The injury to iron fencing.

12th. The taking up broken and putting sound pavement.

All these show the difficulties which attend this small branch of my subject; and they are only to be overcome by practice. I can merely give the outline to guide.

REPARATIONS.

TABLE XIX.

This Table has a double use; it shows the order of taking the items, and the method of Measurement.

BRICKLAYER AND TILER.

All open joints to brick flat or brick-on-edge coping	At per foot super.
Defective filletings	At per foot run.
Defective tile creasing	"
Pointing to pantiling	"
Removing defective tiles, finding and bedding sound	"
Taking down bulged, cracked, or split brickwork, and rebuilding, including scaffolding	At per rod.
NOTE.—Allowance must be made for the bricks that are sound, and can therefore be re-used.	
Sound chimney-pots and setting	At per number.
Pointing open joints of brickwork	At per foot super.
NOTE.—State height from ground, and whether scaffolding will be required, and what kind.	
Cespools, if they require emptying	At per ton.
Earth, soil and rubbish. Quantity must be taken and distances to which they are to be carted	At per yard cube.
Sash frames Door frames } The quantity of pointing required ..	At per foot run.

SLATER.

The removal of broken or defective slates. The re-fixing of loose	At per number.
The re-nailing	At per square.
Ridging defective or deficient	At per foot run.
Shelves, slabs, paving	At per foot super

CARPENTER.

The removal of broken or decayed rafters, purlins, wall plates, joists, and replacing with sound	At per foot cube.
The removing of broken laths and replacement with sound	At per square.
The re-fixing loose boarding and weather boarding	„
The providing new ditto in lieu of decayed, and fixing	„
The providing sound wooden gutters and trunks, and fixing, including removal of old	At per foot run.
Removing decayed boarding to dormers, roofs, gutters, and flats, and reinstating with sound	At per foot super.
The reinstatement of decayed skylight bars	At per foot run.
The removal of decayed sills of sash and door frames, and providing and fixing sound	„

NOTE.—Be sure to notice if those to be removed are oak or deal, &c.

The removal of broken sash-lines, and providing and fixing new	At per number.
Providing new beads	At per foot run.
Ditto pocket pieces	At per number.
Piecing cut bars	„
Providing and fixing sound in lieu of decayed rails and sashes	At per foot run.
Sound panels in lieu of split in doors	At per foot super.
Making good injuries to stiles or rails	At per foot run.
Nosings to stairs	„
New treads	At per foot super.

MASON AND PAVIOR.

Copings	As described to new work.
Curbs	„
Channels	„
Sinks	„
Sink stone	„
Steps and landings; piecing must only be taken where it can be done	„
Walls or other masonry if loose or unsound	„
Paving (remembering that the existing though broken may be squared and re-used, the new quantity required will only be *sufficient* to cover the space after all the stones are squared and used	At per foot super. Labour to squaring edges at per foot run.
Taking up sunk paving and relaying to proper level	At per foot super.
Chimney-pieces cleaning	At per number.
Ditto reinstating	„
Ditto where chipped making good	„
Hearths, front and back	At per foot super.
Pointing to decayed or open joints	At per foot run.
Cramps, defective	At per number.
Ditto reparation	„

Ashlaring and other stone works, and reparation of parts broken	As new work.

Note.—It must be remembered all stonework may be made good by *piecing*.

PLASTERER.

Cutting out cracked or bulged ceiling, plaster and set, or plaster, float, and set	At per yard super

Note.—If re-lathing necessary, add lathing.

Cutting out loose or bulged plastering of walls, render and set, or render, float, and set	At per yard.

(Remember this will necessitate an addition in Painter, of making good paper, or of colouring, as the case may be.)

Enrichments, mouldings, skirting, and cornices	As new work.

(A special price must be placed if the work is old-fashioned, or there is a difficulty in *matching* it for any good reason.)

Repairing cement work of fronts	At per yard super.
Copings	As new work.
Cornices	"
Trusses	"
Caps	"
Sills	"
Plinths and stringings	"
Reveals	"
Dressings	"

PLUMBER AND ZINC-WORKER.

Re-fixing loose work on flats or flashings	As new work.
Removing inefficient lead or zincwork, and providing and laying new	"
Soldering	At per foot run.
Repairing flashings, ridges, hips, valleys, aprons, dormer tops, cheeks, cisterns	At per weight.
Rain-water pipes and heads. Care must be taken that the design of present head is followed in the new work	At per foot run.
Sinks	At per weight.
Pipes of all other kinds	At per foot run.
Water-closet apparatus	At per number.
Water-closet pans	"

PAINTER.

Rub down and paint in coats of oil colour	At per yard.

GLAZIER.

Hack out and re-glaze	At per foot super.
Make good decayed putties	At per foot run.
Reinstate bandings and cementings of lead lights	At per number.

SMITH AND IRONMONGER.

Iron railings. (Particular care is required as to pattern; a sketch should be given.)	At per weight.

Gratings	At per weight.
Gates, making good	At per foot super.
„ hanging or fastening	At per number.
Rain-water pipes	At per foot run.
„ shoes	At per number.
„ gutters	At per foot run.
„ cistern-heads	At per number.
Iron doors	„
Linings to doors	At per foot super.
Locks	At per number.
Latches	„
Hinges	„
Bolts	„
Bars	„

NOTE.—In taking the quantity, state if new required or reparation; if the latter, if new springs, or what requisite has to be supplied.

Beams	At per weight.
Columns	„
Ties	„
Supports	„
Balconies or balconets	„

(When unsafe or defective, it will be necessary to carefully take the exact work requisite to make them secure and perfect.)

PAPERHANGER.

Paper	At per piece.
Canvas	At per yard.

In taking the quantity of paper, the surveyor must try to find out if the pattern can be matched, as if so, only the reparation must be taken; if it cannot be, then the papering of the entire room must be taken in the quantities.

In concluding this portion of the subject, I may, perhaps, mention that it is seldom the surveyor takes the trouble of measuring up what is necessary in the shape of repairs, as in most cases the specification is handed to the builder, and he prepares his estimate therefrom. taking his own dimensions from the building; and whatever is done extra thereto is customarily charged as daywork, i. e. the time expended on the labour, and the quantity of material used. But, at the same time, how is the surveyor to estimate the cost of dilapidations, for example, without measuring the various items? That in many cases they are not measured is proved by the wondrous difference in their estimates. I have given, therefore, this

Table for the guidance of such as are disposed to adopt most business-like method of treating repairs. Of course items are taken, in many cases, the same as new work; b full description must be given as to the requirements, as price will be considerably in advance of the new. Great is necessary, therefore, when dealing with repairs.

CHAPTER XVI.

ABBREVIATIONS.

ADOPTED COMMONLY BY THE PROFESSION—IN SOME CASES UNADVISABLE—VARY—SAME SYSTEM THROUGHOUT THE PROFESSION—CLASSIFICATION OF—MORE USED IN JOINER—TABLE OF.

IN concluding my subject on the measurement of builders' work, I give some of the more common abbreviations adopted by the profession to shorten, in some measure, the task of so much writing, in describing the various items. I have already stated that abbreviations, whilst of service to the more mature members of the profession in taking off the quantities, are, in certain cases, unadvisable—where, for instance, the dimensions had to be abstracted by a second person, who, if he does not understand them, will lose the time, in finding out, that was gained by the person taking off. Again, abbreviations vary so. Persons adopt their own, and each system may be different. When, however, the person taking off also abstracts and bills, abbreviations are, to a certain extent, advantageous, owing to the saving of time; but as, at a future period, a question may arise, and a second individual have to go over the items, my objection will, I think, hold good. Still, there is no reason why the same system of abbreviating should not be pursued throughout the profession, and then all would be right. I submit the following, therefore, as being the most usual, and those most frequently applied. All uncommon items or expressions should invariably be written *in extenso.* I classify them according to the trades. They are used more extensively in the Joiner than in any other trade.

TABLE.

BRICKLAYER.

Item.	*Abbreviation.*
Brick	B., as 1 B. (indicatin the thickness of wall) B. on edge, B. flat.
Bedded and pointed	B. & P., as Frames B & P.
Pargeted and cored	P. & C., as Flues P. & C
Rough cutting	R. C.
Cutting to skewbacks	C. to Skew.
Relieving arches	R. A.
Bird's mouth	B. M.
Squint quoin	S. Q.

MASON.

Half-sawing	½ Sawg.
Plain work in beds and joints	P. W. in B. & J.
Plain face	P. F.
Sunk face	S. F.
Moulded face	M. F.
Circular plain face	C. P. F.
Fair ends	F. E.
Ends cut and pinned	Ends C. & P.
Weathered and throated	W. & T.

CARPENTER AND JOINER.

Deal	D.
Rough	R.
Wrought one side	W. 1 S.
Framed	F.
Beaded	B.
Braced	Br.
Chamfered	Ch.
Splayed	Sp.
Moulded	M.
Rebated	R.
Feather-edged springer	F. E. S.
Tilting fillet	T. Fillet.
Herring-bone strutting	H. B. S.
Boarding	B.
Proper door case	P. D. C.
Deal wrought, rebated, and beaded frame	D. W. R. & B. Frame
Double rebated and beaded jamb linings	D. R. & B. J. Lining
Proper ledged door	P. L. Door.
Six-panel deal double-margined door—the lower panels bead flush and square, and the four upper panels bolection moulded and raised one side, and bead butt at back	6 P. D. D. Margd. I Lower P. B. F. Sqre., 4 up. P. Bo M. & Raised 1 S. B. B. at back.

Deal cased frames, oak, sunk sills, 1½ in. ovolo moulded sashes, double hung with brass axle pulleys, patent lines, and iron weights	D. C. F., O.; S. C. 1½ O. M. S.; D. H.; B. A. P.; P. L.; & I. W.
Treads and risers, with moulded nosings, and strong fir carriages, glued, blocked, and bracketed	T. & Risers; M. N.; & S. F. C.; G. B. & B.
Wrought, rebated, and beaded outer string ..	W. R. & B. Oute String.
Rounded ends	R. E.
Returned ends	Retd. E.
Mitres	M.

SMITH AND FOUNDER.

Wrought iron	W. I.
Cast iron	C. I.
Chimney bar	C. B.
Rain-water pipes	R. W. P.

PLASTERER.

Render	R.
Render, float, and set	R. F. & S.
Lath, plaster, float, and set	L. P. F. & S.
Lath, plaster, float, set, and twice whiten	L. P. F. S. 2ce. W.
Stucco	S.
Wash, stop, and whiten	W. S. & W.
Twice	2ce.

PAINTER.

Oils	O.
Flatted	F.
Grained	G.
Varnished	V.
Stained	S.

CHAPTER XVII.

CUBING.

CUBING OFTEN USED—EXPERIENCED SURVEYOR CAN ESTIMATE VERY CLOSELY—ADVICE—CUBE EVERY BUILDING FOR WHICH QUANTITIES TAKEN—METHOD OF CUBING—PRICE PER FOOT CUBE AFFECTED BY FINISHINGS—NATURE OF SOIL, &C.—EXAMPLE RED BRICK WHERE NONE MADE—COST PER FOOT AFFECTED BY SIZE OF BUILDING—TABLE OF PRO RATA COST.

CUBING, although not strictly a part of the quantity surveyor's work, is often used to obtain the approximate cost of a building.

An experienced surveyor, having seen the drawings, and being given the cubic contents of the building, with a general description of the materials to be used in its construction, and the finishings, will be able to estimate very closely the cost.

If the method is adopted of taking out the cubic contents of every building for which quantities are taken, and from the estimate working out the price per cubic foot, some valuable material for the comparison of relative cost will soon be obtained.

Further, I advise that when the building is finished, the actual cost per foot cube be again tested, and this, unlike the estimate, will give what the real cost of the building is.

This will be found very useful at a future day, when advising clients as to the expected outlay of somewhat similar buildings, and it will be advisable to keep such memoranda available for reference.

The usual method is to take the length by the breadth, and the result by the height from bottom of footings to half-way up the slope of roof. Additional projections, as bay windows, outbuildings, etc., to be added.

Where the roof is flat, some diversity of opinion obtains as to the measurement, but the usual course is to measure to the top of the parapet.

Of course, the surveyor must remember the price per foot cube will be much affected by the description of the finishings, such as the chimney-pieces, stoves, enrichment of cornices, decorations of the rooms, etc.; also by the extent and depth of basement and position of the site.

The following considerations as to site must be borne in mind:—

1. What is the nature of the soil. The cost of the erection of the intended buildings may be considerably affected—as, for example, should the land contain gravel or sand, the excavation may be a source of profit instead of loss; again, if clay, and the clay is available for brick-making or even for burning into ballast, it will affect cost.

> NOTE.—I may mention an instance now occurring in my own practice. I have just let an estate to be covered with houses, and one condition the builders required was permission to excavate the land on which the houses will stand to an extra depth of 2 feet, and where the gardens will be to any depth, they undertaking that, after filling up the excavation, to put at least 2 feet of good garden mould; and further permission to excavate to any extent under the intended roads, each builder taking the sand to the centre line of the road, provided they filled in with hard, dry rubbish. The proposal was declined as to the roads, because it was pointed out that the drains laid on such made ground would be a source of never-ending trouble. The reason I quote this case is to impress on my readers the importance of considering well the soil and subsoil.

2. What materials are available close to the site.

3. The nearest railway station, and if it has a siding, and o inquire into the rates of carriage of the goods that will be equired.

> NOTE.—As an example of the difference of cost of a building where these points are considered, I give an illustration. An architect or his employer would have a red brick building where there were no red bricks, and the carriage was so great that the cost of the red brick exceeded the cost of good building stone.

4. The cost of labour at the site, for although it is very usual to send the tradesmen from London, or one of the large towns, to erect the building, much expense may be saved by using local labour, especially if local materials, as for example, local stone, is used.

5. It must also be remembered that the *pro rata* cost of small buildings will exceed that of larger buildings.

6. The cost of garden walls, drainage from the buildings, the cubic price only includes usually the drainage of the house to a limited distance, although sometimes it must be carried a great distance, and through an unprofitable stratum of land.

Such are the leading points to be borne in mind.

With regard to the price per foot cube, it varies with not only each class of building, but also at different times, rising and falling with the prices of materials and labour; and it would therefore be manifestly impossible to fix any price in a work of this kind, which seeks to be a text-book for all time. I could hardly give a better illustration of the necessity of watching, not merely the rise and fall of the materials, but also their comparative rise and fall, than by quoting a recent instance where I had erected some stabling next the residence, and which, as it was desired to keep as low as possible so that the view might not be obstructed, I provided a flat roof, and covered it with lead at a cost of only 10 per cent. over the cost at that time of zinc.

In the following table the *pro rata* cost only is given, as, for example, if 4*d.* will pay for a foot cube of cottage building, 5*d.* will cover the cost of the speculative builder's house, and so on. I therefore again urge my readers to keep testing the cost, as it is the only *valuable data* to guide.

NOTE.—I advise that on the margin of each sheet of the calculation be put the prime cost of the principal materials used; for example, the bricks, timber, deals, slates or tiles. Also the price paid per hour for carpenters, stone masons, and others. This will enable the surveyor to make a very exact comparison at any time he may have to refer to his data.

TABLE XX.

The prices in this Table are based on the cost of cottages being worth 4d. a foot cube. Any variation in the cost will of course affect the other classes of building mentioned herein.

	Per foot cube.
Cottages	4*d.*
Houses built by speculative builders	5*d.*
Warehouses	5*d.* to 6*d.*
Stabling	5*d.* to 8*d.*
Ordinary dwelling-houses	5½*d.* to 7*d.*
Gentlemen's residences	7*d.* to 1*s.*
Churches and chapels	8*d.* to 1*s.* 4*d.*

CHAPTER XVIII.

FORMS OF FAIR BILLS.

FORMS OF FAIR BILL WHICH HAVE BEEN WORKED TO—SPECIAL REQUIREMENTS MUST BE ADDED—PREAMBLE GENERAL BILL—EXCAVATOR AND DRAINS PREAMBLE—SPECIMEN FAIR BILL—BRICKLAYER PREAMBLE—SPECIMEN FAIR BILL—SLATER PREAMBLE—SPECIMEN FAIR BILL—MASON PREAMBLE—SPECIMEN FAIR BILL—CARPENTER PREAMBLE—SPECIMEN FAIR BILL—JOINER AND IRONMONGER PREAMBLE—SPECIMEN FAIR BILL—SMITH AND FOUNDER PREAMBLE—SPECIMEN FAIR BILL—GASFITTER PREAMBLE — SPECIMEN FAIR BILL — BELLHANGER PREAMBLE—SPECIMEN FAIR BILL—PLASTERER PREAMBLE—SPECIMEN FAIR BILL—PLUMBER PREAMBLE—SPECIMEN FAIR BILL—PAINTER PREAMBLE — SPECIMEN FAIR BILL — GLAZIER PREAMBLE—SPECIMEN FAIR BILL—PAPERHANGER PREAMBLE—SPECIMEN FAIR BILL—FORM OF SUMMARY.

TO make this edition even more complete than its predecessor, I propose giving forms which comprise the preamble of the general bill, and also the preamble with a sample of the fair bill in *each* trade. It is always so much more satisfactory, I think, to have as a guide something that has been used—that has stood the best of being worked from; I therefore give the forms I have used myself.

It is hardly necessary to remind my readers that they will have to add all special requirements in the preamble, which should be made to vary to suit each particular building; also that the specimens are merely given to illustrate some items in the fair bill.

ESTIMATE No. 1.

MODEL RESIDENCES, RODNEY STREET.

Sanitary Dwellings Company Limited.

Banister Fletcher, F.R.I.B.A.,
Architect,
78. **29, New Bridge Street, E.C.**

Preamble to General Bill.

	£	s.	d.
The buildings to be completed fit for occupation by the of , 1879, under a penalty of £ per day as liquidated damages, delay consequent upon strikes of workmen only excepted.			
Payments will be made to the contractor, on the architect's certificate, at the rate of 75 per cent. of the value of the work done as the work proceeds; an additional 15 per cent. when the architect shall issue his final certificate; and the remaining 10 per cent. on the expiration of six months.			
No part of the work to be let as task work.			
A fully priced copy of the estimate to be deposited with the architect, all extras and omissions to be valued at the prices in the estimate.			
Insure the premises to their full value in an approved office in such manner as may be directed.			
Allow for supplying all water for the use of works, including fees and all temporary plumbing, etc.			
Allow for giving all requisite notices, and paying all fees.			
Allow for erecting, maintaining, and afterwards removing, a hoarding, with the necessary gates and fastenings, fans, planked footway, post and rail fence, etc., to the satisfaction of the local authorities for a length of feet.			

Allow for use of all scaffolding, tackling, plant, etc., required for the use of works.

Allow for clearing away all rubbish and superfluous material, and for twice scrubbing all floors at completion, and leaving the premises clean.

Carried to Summary £

EXCAVATOR AND DRAINS.

Preamble.

The concrete to be composed of one part fresh-burnt ground stone lime to six parts of clean ballast and sand, to be thoroughly mixed, and thrown from a height of six feet.

All excavation to trenches to include strutting and planking, if required.

The drains to be glazed stoneware socketed pipes of the best quality, laid to falls in trenches on a well-rammed bottom, jointed in Portland cement, and joints puddled round with clay, price to include excavation, filling in and ramming, and carting away surplus earth, and all necessary strutting and planking.

Specimen Fair Bill.

Yards	Feet	In.			£	s.	d.
453	11	0	Cube	Excavate trenches, part fill in and ram, and cart away surplus.			
152	0	0	,,	Concrete under footings.			
40	0	0	Sup.	Ditto, 6″ thick to receive paving.			
	104	0	Run	9″ glazed stoneware socket drain.			
	144	0	,,	6″ Ditto, ditto.			
			No.	4″ connections of 9″ pipes with main sewer, including all excavation, strutting, planking, etc., in roadway, and making good, and all fees.			
				Carried to Summary £			

BRICKLAYER.

Preamble.

The bricks to be sound, hard, square, well-burnt, and of good shape and colour, and to be equal to samples deposited with architect.

No soft or place bricks, broken bricks or bats will be allowed to be used except where required for bond.

The lime to be fresh-burnt, ground stone lime.

The sand to be clean and sharp, and washed if required.

The mortar to be composed of one part lime to three parts sand, mixed in a mortar mill, and in sufficient quantities only for the day's consumption.

The cement to be the best Portland, of approved manufacturers, and to be mixed in the proportion of one of cement to two of washed sand.

The brickwork to be well flushed up every course, and grouted every four courses, no four courses to raise more than one inch higher than the bricks laid dry.

Specimen Fair Bill.

Feet.	In.			£	s.	d.
142	0	Sup.	Reduced brickwork in footing, and sleeper walls.			
162	0	„	Ditto, ditto, in walls.			
294	0	„	½ brick trimmer in cement.			
032	0	„	Extra only to fair axed arches.			
		No.	36 set cottage ranges.			
			Carried to Summary	£		

SLATER.

Preamble.

All slates to be best Bangor Countess slates, to be laid to a 3″ lap, double courses at eaves

Feet.	In.			£	s.	d.
			and verge, and fixed with two copper nails to each slate.			

Specimen Fair Bill.

Feet.	In.			£	s.	d.
75	0	Sup.	Best Bangor Countess slating.			
219	0	Run	Slate ridge with 6″ wings.			
312	0	Sup.	Double slate damp course laid in cement.			
65	0	”	1″ planned slate shelf.			
20	0	Run	Labour to rounded edge to 1″ shelf.			
			Carried to Summary	£		

MASON.

Preamble.

The whole of the stone used in the works to be of the best description of its kind, free from vents, sand-holes, and all imperfections, and to be set on its natural bed.

Every stone to hold its full length and height square to the back.

Any stonework which may be injured during the erection of the building to be removed and replaced by the contractor at his own expense.

Provide for casing all arrises and projections until completion of building.

Specimen Fair Bill.

Feet.	In.			£	s.	d.
416	0	Sup.	3″ tooled York paving laid in regular courses, and bedded and jointed in cement.			
80	0	”	3″ tooled one side, landings, and ditto.			
143	0	Cube	Portland stone, including moisting and setting.			
40	0	”	Ditto, ditto, above 40 feet from ground.			
410	0	Sup.	Sawing.			
423	0	”	Plain work in beds and joints, all faces measured.			
320	0	”	Ditto, circular and ditto.			
140	0	”	Plain face.			

Feet.	In.				£	s.	d.
42	0	Run	Sunk splay 1″ wide.				
312	0	,,	Chamfer 2″ ditto.				
		No.	20 stopped ends to moulding 9″ girt.				
		,,	10 external mitres to ditto.				
			Carried to Summary	£			

CARPENTER.

PREAMBLE.

The timber throughout to be of the best description of Memel, Riga, or Dantzic, sawn die square, free from sap, shakes, large, loose, or dead knots, and all other defects, and sawn into scantlings immediately after signing of contract.

The oak to be of English growth of the best quality and well seasoned.

The whole of the specified or figured dimensions of timber to be the finished sizes when fixed in the building.

SPECIMEN FAIR BILL.

Feet.	In.				£	s.	d.
024	6	Cube	Fir in plates, lintels, and bond.				
26	0	,,	Ditto, in girders.				
793	0	,,	Ditto, framed in roofs.				
141	6	,,	Ditto, ditto, in quarter partitions.				
57	0	Sup.	¾″ battening 2½″ wide for Countess slating.				
890	0	Run	2″ rounded roll for lead.				
		No.	42 fir cleats to purlins 1′ 6″ long.				
			Carried to Summary	£			

JOINER AND IRONMONGER.

PREAMBLE.

The whole of the material to be sound and well seasoned, free from shakes, large, loose, or dead knots, and all other defects.

The deals to be the best yellow Christiania.

The teak to be the best Moulmein.

The mahogany to be of the best quality of its kind, of good figure, and carefully prepared for French polishing.

The dimensions figured and measured in the bill of quantities, to be finished sizes when fixed.

The pitch pine intended for varnishing to be of good figure and secretly fixed.

The ironmongery to be of the best description of its respective kind, and to include screws and fixing; all brasswork and finger plates to be fixed with brass screws.

SPECIMEN FAIR BILL.

Sqrs.	Feet	In.			£	s.	d.
122	7	0	Sup.	1″ yellow batten flooring laid straight joint.			
	617	0	Run	1″ × 7″ deal torus skirting, including backings.			
			No.	56 extra to tongued and mitred angles.			
	517	0		2″ four-panel and square door moulded one side.			
	616	0		Ditto, ditto, moulded both sides.			
				Carried to Summary	£		

SMITH AND FOUNDER.

PREAMBLE.

All cast and wrought iron to be of the best quality, and to include fixing.

All girders to be tested to half their breaking weight at contractor's expense, if required by the architect, and the contractor shall replace any defective girder with new.

Cwts.	Qrs.	Lbs.		SPECIMEN FAIR BILL.		£	s.	d.
				Wrought Iron.				
411	2	14		In riveted girders, including fixing.				
50	1	7		„ rolled iron, ditto.				
2	3	7		„ chimney and bearing bars.				
				Cast Iron (including patterns and fixing).				
24	1	0		In plain girder.				
56	0	14		„ solid columns.				
	Feet.	In.						
	616	0	Run	4½ half round iron eaves gutter.				
			No.	12 angles.				
				14 outlets.				
				Carried to Summary	£			

GASFITTER.

PREAMBLE.

The pipes to be wrought iron, welded tubing with all necessary tees, angles, bends, and connections, and all jointed in red lead.

All work to be done to the satisfaction of the Gas Company's inspector, and to be left perfect.

				SPECIMEN FAIR BILL.		£	s.	d.
	214	0	Run	1″ welded gas tubing.				
	431	0	”	¾″ ditto, ditto.				
	409	0	”	½″ ditto, ditto.				
			No.	45 one-inch bends.				
			”	24 ditto tee pieces.				
			”	35 half-inch elbows.				
			”	3 four-light gaseliers, p. c. £7 each.				
				Carried to Summary	£			

BELLHANGER.

PREAMBLE.

All bells to include best steel springs and strong carriages, and best brass cranks, stout,

Yards	Feet	In.			£	s.	d.
				well-stretched copper wire and concealed zinc tubes.			
			No.	12 lever pulls with white-and-gold furniture on first floor to ring on ground floor.			
			”	2 call bells and brass slides on ground floor to ring on third floor.			
			”	1 Bronzed, dished, and sunk pull, 6″ diameter and fixing at entrance, engraved "Visitors," to ring on ground floor.			
				Carried to Summary £			

PLASTERER.

PREAMBLE.

The sand to be clean and sharp, free from salt or clay, &c., and to be washed if required.

The lime to be the best chalk lime, that for the setting coat to be run into putty at least one month before required for use.

The hair to be best long hair, and to be well beaten.

The laths to be the best rent laths, butted at joints and the joints frequently broken.

The Portland cement for external work to be of approved manufacturers, and to be mixed in the proportion of one of cement to two of washed sand.

SPECIMEN FAIR BILL.

Externally, Portland Cement.

Yards	Feet	In.			£	s.	d.
641	7	0	Sup.	Plain face on brick.			
54	3	0	”	Ditto, jointed.			
	614	0	Run	Moulding 5″ girt.			
			No.	41 mitres to ditto.			

Internal Work.

Yards	Feet	In.			£	s.	d.
45	7	0	Sup.	Render, one coat.			
947	5	0	”	Render, float and set.			
365	6	0	”	Lath, plaster, float and set.			
	794	0	Run	9″ plain moulding.			
			No.	64 mitres to ditto.			
			”	3 centre flowers 36″ diameter, p. c. 30*s.* each.			
				Carried to Summary £			

PLUMBER.

PREAMBLE.

To include all soldered joints, wall hooks, &c., necessary for the due execution of the works.

The water supply to be executed in accordance with the regulations of the Water Company, and to the satisfaction of their inspector.

The pipes to weigh the following weights per yard run in lbs. :—

	½"	¾"	1"	1¼"	1½"	2"
Middling	,,	,,	,,	,,	,,	,,
Strong	,,	,,	,,	,,	,,	,,

SPECIMEN FAIR BILL.

rts.	Qrs.	Lbs.			£ s. d.
40	2	9		Milled lead and labour in flat.	
1	3	7		Ditto, in flashings.	
ards.	Feet.	In.			
	463	0	Run	¾" strong drawn lead pipe and fixing.	
			No.	20 joints to ¾" pipe.	
				Carried to Summary £	

PAINTER.

PREAMBLE.

All work to be properly cleaned, rubbed down, knotted, and stopped.

The oil colours to be made of the best white lead and pure linseed oil.

The varnish to be the best copal.

SPECIMEN FAIR BILL.

71	0	0	Sup.	4 oils on wood finished plain.	
97	0	0	,,	Ditto, on cement, ditto.	
	312	0	Run	Ditto, on skirting, 11" girt.	
	309	0	,,	Ditto, chair rail, 6" girt.	
250	0	0	Sup.	Extra grain in imitation wainscote and twice varnish.	
	70	0	Run	French polishing to 4 × 3 mahogany moulded handrail.	
				Carried to Summary £	

GLAZIER.

PREAMBLE.

All glass to be the best of its respective kind, free from all bubbles, scratches, and other defects, and to be properly bedded, puttied back, puttied and sprigged where requisite.

Allow for supplying the necessary templates for the lead glazing.

SPECIMEN FAIR BILL.

	In.			£
74	0	Sup.	21 oz. sheet glass under 3 ft. super in a square.	
94	0	"	26 oz. ditto, under 4 ft. ditto.	
141	0	"	Ditto, ditto, 6 ft. ditto.	
150	6	"	21 oz. patent plate under 9 ft. super in a square.	
41	0	Run	Cutting ditto to semicircular head.	
			Carried to Summary	£

PAPERHANGER.

PREAMBLE.

All the walls to be rubbed down and carefully prepared to receive paper.

All the paper to be hung with butt joints.

SPECIMEN FAIR BILL.

Pieces. 148	No.	Paper of the p. c. value of 1s. per piece, and hanging same.	
294	"	Ditto, ditto, p. c. 3s. per piece, and ditto.	
Dozen yards. 63	Run	Border, p. c. 4s., and hanging same.	
		Carried to Summary	£

SUMMARY.

				£	s.	d.
No.	1	General Bill				
„	2	Excavator and Drains				
„	3	Bricklayer				
„	4	Slater				
„	5	Mason				
„	6	Carpenter				
„	7	Joiner and Ironmonger				
„	8	Smith and Founder				
„	9	Gasfitter				
„	10	Bellhanger				
„	11	Plasterer				
„	12	Plumber				
„	13	Painter				
„	14	Glazier				
„	15	Paperhanger				
„						
			£			
		Add for surveyor's charges 2½ per cent. on the foregoing amount, to be paid out of the first instalment				
		Add for lithography of quantities and expenses				
		Carried to Tender	£			

CHAPTER XIX.

PRICED SCHEDULES.

PRICED SCHEDULES—METHOD OF WORKING—TABLES CONTAIN ALL ITEMS—DIFFICULTY IN DISCOVERING WHOSE SCHEDULE LOWEST—MAKE CALCULATIONS BEFORE—ITEMS OF WHICH LITTLE QUANTITY PUT LOW—OTHERS OF WHICH LARGE QUANTITY, HIGH—DISADVANTAGE OF NOT KNOWING COST—GOVERNMENT WORK BY PRICED SCHEDULES.

I HAVE been asked to say what is the method adopted where, either from want of time, or from the builders disliking to be bound by the measurements taken from the drawings by the surveyor, it is decided to build by a *schedule of prices*.

The method is very simple. The surveyor takes this book, and, having before him the drawings of the proposed building, turns to, say TABLE II., and probably will find that this Table contains every item required in his building, or, if there is anything special, he adds such item, and omits any other that may not be required for the execution of the particular building. He then turns to the next Table, and treats that in the same way.

Having thus completed all the trades, and written preambles to each, and the general preamble, it is usual to have them lithographed and issued to those builders who are invited to tender. On the day appointed for opening the tenders, some difficulty will probably arise in discovering whose *priced schedule* it is desirable to accept, because, in all probability, one builder *will be lower* in one item than another, and higher in some other items. In receiving these tenders, I always make, before the day, calculations of the different trades, so as to be able to advise my client as to which items are most important, because a builder may put all the items of which little are wanted very low in price, and yet, by putting a trifle higher than the other competitors the items of which large quantities are required, may make the cost of the building amount to more.

Beyond the serious drawback of the difficulty of discovering which tender will really give the client the cheaper building, is the further disadvantage that the client does not know what the building will cost.

In all commercial matters it is usual for a man to know beforehand what he has to pay, so that he may know whether he can afford it—whether he is justified in incurring the outlay. Doubtless one reason why architects are not always employed is the uncertainty of the cost of buildings erected from their designs. I therefore think it wise to caution the young practitioner not—unless there is some strong and special reason—to build by this method, but by quantities in the usual way, and have the priced quantities of the successful builder lodged for pricing extras and omissions, if there are likely to be many. The Government of this country has much work done by priced schedules, and these schedules are revised periodically, This is an excellent method for them to pursue in restoration of forts, barracks, and other works where the *quantity* of work that will be required is uncertain.

If priced schedules are required, the Tables already given in this book can be used for the purpose.

PRICED SCHEDULES.

Read paragraph two of this chapter, which explains how to use these Tables for this purpose.

See Table I. Excavator.
" " II. Bricklayer.
" " III. Tiler.
" " IV. Slater.
" " V. } Mason.
" " VI. }
" " VII. Carpenter
" " VIII. Joiner.
" " IX. Smith and **Founder.**

See Table X. Gasfitter.
" " XI. Bellhanger.
" " XII. Plasterer.
" " XIII. Plumber.
" " XIV. Zinc-worker.
" " XV. Painter.
" " XVI. Gilder.
" " XVII. Glazier.
" " XVIII. Paperhanger.
" " XIX. For reparations.

CHAPTER XX.

THE LAW.

IFFICULTIES THAT SURROUND PROFESSIONAL MEN—ADVICE—PURSUE YOUR VOCATION EARNESTLY AND HONESTLY, AND NEVER FEAR THE LAW—LEGAL PROFESSION, OPINION UPON—MY PUBLISHER'S OPINION—NECESSITY FOR CHECKING THE OPINIONS AND KNOWLEDGE ONE POSSESSES—CASE, 1879—ARCHITECT TAKING OUT HIS OWN QUANTITIES—GREAT POWER GIVEN TO ARCHITECT—CASE, ARCHITECT RECOMMENDING QUANTITY SURVEYOR AN ARRANGEMENT THAT FOR THE INTRODUCTION A FEE OR REWARD IS TO BE PAID ARCHITECT—ARRANGEMENT VOID—IF KNOWN TO EMPLOYER, THEN GOOD AND VALID—CORPORATIONS AND BOARDS OF GUARDIANS AND PUBLIC BODIES, HOW BOUND—SURVEYOR COULD NOT RECOVER—LEGAL DEFINITION OF THE DUTIES OF THE ARCHITECT—EMPLOYER AND THE CONTRACTOR—IF WORK UNFINISHED, CONTRACTOR ENTITLED TO NO PAYMENT—VARIATION OF THE LEGAL CONTRACT BY INSERTION OF CONDITION TO PAY BY INSTALMENTS—ILLUSTRATION OF THE LAW—CONTRACT TO BUILD A MILL AND UNDERTAKING THAT IT SHOULD ANSWER—CONTRACT TO BUILD AND NOT COMPLETED BECAUSE OF A REFUSAL TO. SUPPLY MONEY—CASES SHOWING SKILL AND KNOWLEDGE OF SURVEYOR NECESSARY TO OBTAIN PAYMENT FOR SERVICES—SURVEYOR'S SERVICES MUST BE OF USE TO HIS EMPLOYERS TO ENSURE PAYMENT—ILLUSTRATION—AUCTIONEER'S CASE-CERTIFICATES—SPECIFICATIONS—HOW AN ARCHITECT MAY FORFEIT OR LOSE HIS POSITION BY CONCEALMENT—THE WORDING OF THE PROVISO GIVEN AS TO DIFFERENCE—PROTECTION GIVEN BY THE LAW TO ARCHITECTS—LIABILITY OF ARCHITECT WHO TAKES OUT QUANTITIES—FORM OF CONTRACT—THIS FORM IS USEFUL AS A PRECEDENT—QUANTITIES WITH THE DRAWINGS AND GENERAL CONDITIONS TO FORM BASIS OF THE CONTRACT—UNUSUAL CONDUCT OF THE ARCHITECT—CLAIM OF PLAINTIFF THAT ARCHITECT DID NOT USE DUE CARE—POSITION OF ARCHITECT AS ARBITRATOR—CASE GIVEN IN EXTENSO, AS BEING SO RECENT AND IMPORTANT—*LORD CHIEF JUSTICE* COLERIDGE SUMMING UP—JUSTICE DENMAN

—WHAT COMMISSION SHALL BE PAID TO QUANTITY SURVEYORS—DECISION OF MR. JUSTICE QUAIN—REMARKS ON THIS DECISION—AUTHORITY TO ADVERTISE FOR TENDERS INCLUDES, ALTHOUGH NOT MENTIONED, THE RIGHT TO AUTHORIZE QUANTITIES—RULING OF CHIEF JUSTICE MONAHAN—LIABILITY OF ARCHITECT—ARCHITECT SHOULD DISCLOSE PRINCIPAL—ARCHITECT MAY BE PERSONALLY LIABLE TO PAY QUANTITY SURVEYOR—LIABILITY AS TO DEFICIENT QUANTITIES AND AS TO EXCESSIVE QUANTITIES—WEIGHTING QUANTITIES—THE UNFAIRNESS—WHY CLIENTS REFUSE TO HAVE IN SOME INSTANCES QUANTITIES—QUANTITY SURVEYOR LIABLE—HE WHO PAYS FOR QUANTITIES HAS A REMEDY.

I HAVE been repeatedly urged to explain how the law affects those who practise as architects and as quantity surveyors; and I have replied by letter to many who have written to me—"Do your duty without fear or favour, and rest assured you need not fear the law." I have further said that the law, although undoubtedly uncertain in many things, does give great protection to those who honestly pursue any vocation, and especially to professional men of all classes, except where negligence or incompetence is shown.

I have thought this sufficient, with the added advice—should you get into difficulty, go to an honest lawyer. It is the habit to speak against the members of the legal profession (I speak of what is called the lower branch, now only known as solicitors, the attorney being extinct by Act of Parliament); but I do not believe there is one of my numerous readers who cannot say he has great confidence in some particular member; and I firmly believe that there is no profession which has more power to do right or wrong, and which almost invariably uses that power in the cause of right, by giving good advice, preventing clients from entering into litigation, and preserving as sacred trusts all professional secrets. Why, therefore, it may be asked, are solicitors so often spoken against? The reply is (1) The *habit* has descended from remote times; (2) All men try to blame some one else for their misdeeds. What so easy as to say, "I should not have brought the action only my solicitor advised me to do so"? yet probably, if the man who says so would try to remember the exact fact, he would recollect it was he who said he knew he had a good case, and if they (the solicitor) could not see it, he had better go elsewhere; or, he did not care if it cost him £100, he was determined he would not, etc. But why pursue the reasons? Who in large practice in our profession does not know how often every advantage or beauty a villa or mansion possesses is due solely to our client, while every drawback or ugliness is due solely to the architect? It is, as Sam Slick would say, "human natur'."

Pardon this digression. Thinking I had settled my correspondents and "the law," I was happy. Alas no! My publisher called. I suppose he had received similar letters, and said, "You owe it to the public, who have bought your books so freely, to do your utmost to make the work most complete. Why not give an exhaustive legal chapter?" And he was good enough to add, "You are so often attending the courts, giving professional evidence, sitting as arbitrator and umpire, it will be easy work for you."

Easy work indeed! Wrong, my worthy publisher, wrong, for, let a man feel as certain as possible, immediately he commences to put his views and opinions on paper, he hesitates. Long practice makes him feel certain he knows the law as it applies to that limited area—his own profession. He feels, however, and should feel that, as his words will circulate among thousands and guide them, they must be verified, and he is therefore constrained to consult the legal authorities afresh, so as to confirm what he knows, and assure himself that he is not misleading his readers.

One of the most important cases I shall quote—in fact, give much *in extenso*—is the case of an architect employed by a company, and who took out his own quantities; and the decision of the court will, I think, surprise my readers, as the verdict would appear to give more power to the architect than he usually assumes. The case is very recent. It was only tried in March, 1879.

Before I treat of that, let me lay before my readers the law on a few other points.

It would appear by analogy from the case *Richardson* v. *Mellish*, 2 Bing. 242, that if an architect recommended a surveyor to take out quantities, on the understanding that the surveyor should pay him (the architect) a reward, the contract between the architect and the surveyor is void if unknown to the employer; if the contract or arrangement is known to the employer, then there is nothing illegal in it, and it can be enforced.

A difficulty most unlikely to occur, it is, however, necessary to mention, as it has happened. It would appear Corporations, Boards of Guardians, and other public bodies cannot give verbal orders except for small, and what are considered necessary, contracts, without deed.

A surveyor had made a plan of the parish of St. Clement's Danes, and attended as a witness in support of his plans and valuation on the verbal orders of the guardians of the Strand Union.

Held, not entitled to recover anything for his labour.

When the quantities are prepared either for the new building or the reparation of an old one, it is usual to prepare the contract in writing. This is undoubtedly the wisest and safest course, but the law says that contracts for building or repairing houses, or for doing any works upon lands, if they may be performed within a year from the making thereof, need not be in writing.

It would appear that in some cases the architect would do wisely not to act as quantity surveyor in measuring extras and omissions at the conclusion of contract. It is when he has to determine the amount due to the builder and has assured the employer that the cost shall not exceed a certain sum, he does not in the eye of the law possess the unbiassed mind which will enable his decision to be just and conclusive, and the builder may bring a claim for a sum over and above that allowed by the architect. It appears from this that it would be imprudent on the part of an architect to take upon himself the function of determining the amount due to the builder, at least in cases where he has given such an assurance to his client, as he may be leading the latter into a position which he ought not to occupy; and that his better course would be, as agent to his client, to put the winding up of the account in the hands of an independent surveyor. The cases which bear this out are *Kemp* v. *Rose*, 27 L. J., Ch. 264; and *Kimberley* v. *Dick*, L. R., 13 Eq. 1. The legal definition is very clear—

> "In treating of the contract to perform works, the method proposed is to state the general duties of each party separately. In such a contract one party, termed the contractor, agrees to perform certain works; and the other, termed the employer, agrees to pay a certain reward. The duties of the contractor are, first, to finish the work; secondly, to use care and skill in the performance; thirdly, to do it within a proper time; fourthly, to comply with the particular stipulations in the contract as to manner of performance. The duties of the employer are, first, to pay; secondly, not to prevent but to assist the contractor in his execution of the contract.
>
> "The first duty of a contractor is to complete his contract, that is, to finish all the work he has agreed to do. If he contracts to do a specific work for a specific sum, he must perform the whole of the work before he is entitled to receive payment of any part of the price; so long as the work is unfinished, he is entitled to nothing."

Of course, the condition in the contract of instalments, varying from 70 to 80 per cent., varies this last legal maxim that he is entitled to nothing until the building is fully completed.

But to show that a contractor must perform most fully what he undertakes, I would cite the following case:—

> "So, where the contract was to build a mill for a specified sum, and if it did not answer, to build another, the court decided that the plaintiff could recover nothing for building the mill, unless he either proved that it had answered or had been accepted by the defendant."

Another curious case I give—

> "And when the action was on a contract to build a house for a certain sum, which the plaintiff did not complete because the defendant had refused to supply him with money as he went on, Coleridge, J., ruled that 'he was not entitled to receive anything under the contract until he had finished the house;' and he failed to recover anything for the work done under the contract, although he recovered for extra works."

These last cases may not seem to affect surveyors who take out quantities; but to make this work most useful I give all cases that affect both the taking out the quantities and the carrying out the building, and those who limit their operations to the former can skip the law on the latter.

I have great pleasure in availing myself of Mr. Arthur Cates' permission to print here what he describes as

The Surveyor's Decalogue.

1. That, when tenders are required from a number of builders for the erection of a building, it is essential that bills of quantities should be prepared, in order that each of them may make his tender on identically the same basis.
2. That, in the absence of special instructions to the contrary, it is the duty of the architect to make the necessary arrangements for the providing of such bills of quantities.
3. That, for this purpose, the architect is the agent of his client, and the client is bound by his acts, whether cognizant or not of them or of the custom.
4. That, until a tender is accepted, the client is liable to the surveyor so appointed by the architect for the amount of his commission, and the expenses incurred.
5. That, on the acceptance of a *bonâ-fide* tender, the liability to the surveyor shifts from the client to the builder; the surveyor accepts the builder as responsible to him, and his right of claim against the client ceases.
6. That, if the work is abandoned before a tender is accepted, the client pays the surveyor; if after, the accepted builder pays, and has his remedy against the client.
7. That, as a matter of convenience, it is the custom that the architect should include, and it is an obligation on the architect so to include, in his first certificate such reasonable charges and expenses of the surveyor; but the liability of the builder is not affected by this practice, and commences immediately on the acceptance of his tender.
8. That a surveyor employed directly and solely by the builder, without the intervention or concurrence of the architect, has no claim against the client, and must look for payment to those who employed him, and on whose instructions he acted.
9. That there are circumstances under which an architect may make himself personally liable to a surveyor, but they are of infrequent occurrence, and are not likely to arise with architects of any standing or repute.
10. That the surveyor is liable to the builder for proved inaccuracies or deficiences in the quantities, and it is an obligation on him to prepare his quantities with the utmost care and accuracy, that the client may not suffer by excess, or the builder by want therein; and to fulfil his important duties with the strictest honour and integrity.

The following case shows that surveyors must prove they have skill or knowledge of their profession, although the law will not allow them to be deprived of their remuneration for some small mistake:—

"In an action by an engineer for planning and making estimates for a bridge, the defence was that he did not bore or examine the soil for the foundation, and in consequence the company, for building the bridge, were put to an extra expense of £1600. Abbott, C.J., said—'If a surveyor who makes an estimate sues his employers for the value of his services, it is a defence that he did not inform himself, by boring or otherwise, of the nature of the soil of his foundation, and it turned out to be bad, for this goes to his right of action.' On another trial on the same claim, Best, C.J., stated the law to be that 'unless the negligence and want of skill was to an extent that rendered the work useless to the defendants, they must pay him and seek their remedy in a cross action; for if it were not so,' he said, 'a man might by a small error deprive himself of his whole remuneration.' He further observed, 'that a man should not estimate a work at a price he would not contract for it; for if he did, he deceived his employer.'"

Probably I can quote no case so indicative of what the public pay for than the case of an auctioneer, as it shows so fully that what is to be paid for is something of use to the employer; if therefore *quantities* are so faulty as to be misleading or useless or injurious, it would appear they need not be paid for.

"An auctioneer, who was employed to sell a leasehold estate, failed to recover anything for his services because he had omitted to insert a condition in the particulars of sale, that the purchaser should not inquire into the landlord's title, and in consequence his employer was unable to make out a title to the purchaser, who refused to complete the purchase. Lord Ellenborough observed—'When the plaintiff proceeds upon a *quantum meruit*, the just value of his services may be appreciated; and if they are found to be wholly abortive, he is entitled to recover no compensation.'"

Certificates.—The following will show the power of the architect or surveyor:—

"If the contract provides that the contractor shall obtain the certificate of the employer's architect before payment, he must do so. That he shall obtain such certificate is a condition precedent to his right of payment. A builder agreed to erect certain buildings under the superintendence of A. B. Clayton, or other the architect of his employer for the time being; and the contract, after providing for payment of portions of the price during the progress of the work, stipulated that the balance found due to the builder should be paid by the employer within two calendar months after receiving the said architect's certificate that the whole of the buildings and work thereby contracted for had been executed and completed to his satisfaction. It appeared that Mr. Clayton had examined and approved of the builder's charges, and had written to the employer to that effect, but had not given a certificate that he was satisfied with the manner in which the work had been done. This was held to be a condition precedent to the builder's right to recover for the work, and to apply to extra and additional works, as well as those specified in the contract."

Specifications.—Entitled to have these strictly enforced. The following case so clearly sets this forth that I cannot do better than quote it:—

> "In cases in which the work has been done in a manner different from that specified in the contract, the employer is not bound to pay the contract price, nor the value of the work done. He is bound to pay the contract price, less the amount it will take to alter the work, so as to make it correspond with the specification. This should be understood as applying to a case in which the employer either has, or intends to have, the work altered and made to correspond to the original contract. If he has accepted the inferior work, and does not intend to have it altered, then it seems reasonable that the workman should recover the value of the inferior work, taking the contract price as the criterion of the value of the works specified; that is, that he should have so much less than the contract price as the inferior is less valuable than the works contracted to be performed. For instance: if a builder has contracted to build a house with the best bricks at the price of inferior bricks, and he uses inferior bricks, and his employers accept and use the house, he ought not to recover the contract price, because he has not performed his contract; nor ought he to recover the value of the bricks used, because that might be as much, or more, than the contract price, and he must suffer for breaking his contract; nor ought the employer to be allowed for pulling down and rebuilding the house with the best bricks, because he does not intend to do so, but is content to accept the house built with inferior bricks. But the difference in value between the bricks agreed to be used and those actually used should be deducted from the contract price; and by this means the builder will lose just as much as he expected to gain by his roguery."

Next let us see what an architect may not do without losing his position. A curious case will illustrate this. An architect, A, entered into an undertaking with his employer, B, that a house should be erected for a sum which was not to exceed £1500, including his own commission and all expenses, and engaged a builder to give an estimate based on the quantities this architect had prepared. This builder then entered into a contract with B for the completion of the work, according to A's plans and under A's superintendence, for £1369, with power for A to order extra works, and with a clause providing that all questions between the parties under the contract should be settled by the award of A.

A did not mention to the builder his undertaking given to B.

It was held that the architect, A, was the agent of the employer; and that his undertaking having been concealed from the builder, the arbitration clause in the contract could not be enforced; and that the plaintiff was entitled to an account for what was due to him for any works executed by him under the architect's direction, not included in the contract, and for any works so executed under the contract, the price of which was not therein included, and for any variations made under the architect's direction of works included in the contract.

So that the architect, through the concealment, was by the law dispossessed of all power, although the proviso in the contract gave him full powers. The wording of the proviso was as follows:—

"And it is hereby further agreed that all questions between the said parties touching the matters relating to this contract, shall be left to the sole determination or award of the said architect; and the said parties hereto respectively shall and will abide by, and perform and keep, the said determination or award made in writing under his hand and seal, delivered to the said parties respectively direct. And it is hereby further agreed by and between the said parties that the submission hereby made shall, at the option and at the expense of either of the parties requiring the same, be made a rule of Her Majesty's Court of Queen's Bench at Westminster."

Some protection the architect has, even if his drawings cannot be carried out, as the following summary of the important case which came before the House of Lords, relating to the rebuilding of Blackfriars Bridge, will show:—

"Where plans and a specification for the execution of a certain work are prepared for the use of those who are asked to tender for its execution, the person asking for the tenders does not enter into any implied warranty that the work can be successfully executed according to such plans and specification.

"The contractor for the work cannot, therefore, sustain an action for damages, as upon a warranty, should it turn out that he could not execute it according to such plans and specification.

"A contractor contracted with the defendants to take down an old bridge and build a new one. Plans and a specification prepared by the defendants' engineer were furnished to him, and he was required to obey the directions of the engineer. The descriptions given were stated to be 'believed to be correct,' but were not guaranteed; and in one particular matter at least, he was warned to make examination for himself. Part of the plan consisted in the use of caissons. These turned out to be of no value, and the work done in attempting to use them was wholly lost, and the bridge had to be built in a different manner. In this way much labour and time were wasted. The contract contained provisions as to the payment for extra work, and that work had (with the contract work) been duly paid for. The contractor sought for compensation, and for his loss of time and labour occasioned by the failure of the caissons, and in his declaration alleged that the defendants had warranted that the bridge could be inexpensively built according to the plans and specification. There was no express warranty to that effect in the contract.

"*Held*, that none could be implied.

"*Semble*, that if he had any remedy under these circumstances it was not in an action for damages as for breach of warranty, but for compensation as upon a *quantum meruit*."

The most recent case relating to the liability of the architect when taking out quantities is that tried in March last year, and as it will be most probably the *test* case, it will be our duty to give much of the argument in full, for nothing gives one a better knowledge of the *law* of a subject than attentively studying a case like this.

The case is *Stevenson* v. *Watson*, and was tried on the 6th and 7th of March, 1879. The plaintiff was a builder, the defendant an architect.

The architect was employed by a company to build a hall, and he prepared plans, drawings, specifications, general conditions of contract, and a *bill of quantities* of the works. Having done so, and the plans being approved, he was appointed by the company to carry out the works, and to be the architect under the contract proposed to be entered into by the company.

Next the company advertised for tenders, directing applications with reference thereto to be made to the defendant; and plaintiff, after examining the plans, drawings, specifications, and bills of quantities of the proposed works at the office of the defendant, sent in a tender, and the tender was accepted.

The plaintiff, at the request of the defendant, attended with his partner at the office of the latter, and signed the contract, the defendant witnessing the builder's signature.

The contract was made in the usual way—the plaintiff and his partner of the one part, and the company of the other part. The words were as follows :—

> NOTE.—The wording will be useful to my readers, not merely in illustrating this case, but also as giving a form which may be usefully followed, for my readers will find in the result the judgment was in favour of the architect, the defendant.

"The said Richard Stevenson and Field Weston agree to erect and build for the said company . . . the hall, according to the drawings, general conditions of contract, and bills of quantities now produced and signed by the parties hereto, and intended to form parts of this agreement, and shall and will finish and complete the hall in such manner, and of such materials, and within such time as is provided by the said general conditions of contract and bills of quantities, and according to the said drawings; and further, that they, the said Richard Stevenson and Field Weston, will well and truly observe and perform all and every the said conditions and stipulations contained in the said general conditions of contract on the part of the contractors required to be observed and performed, and, in consideration thereof, the said company to pay unto the said Richard Stevenson and Field Weston the sum of £13,560 in the manner set forth in the said general conditions of contract, and in other respects to perform and keep the conditions and stipulations of the said general conditions of contract, so far as the same on their part is or ought to be performed and kept."

The general conditions of contract referred to in the contract, so far as they were material to this case, were as follows :—

"The general conditions of contract for artificers' works required to be done in the erection and completion of a new hall for the Nottingham Temperance Hall Company, Limited, Nottingham, Fothergill Watson, architect, Churton Street, Nottingham, January, 1874." "The architect is at all times to have access to the works, which are to be entirely under his control, and his clerk of the works. The architect may order any additions to or deductions from the contract without in any way vitiating the contract, and the amount of such additions to or deductions from the contract shall be ascertained by the architect in the same manner as the 'quantities' have been measured, and at the same rate as they have been priced at.

"The contractor and the directors will be bound to leave all questions or matters of dispute which may arise during the progress of the works or in the settlement of the account to the architect, whose decision shall be final and binding upon all parties.

"The contractor will be paid on the certificate of the architect."

The said bill of quantities contained (amongst others) the following stipulations :—

"Note.—These quantities will, with drawings and general conditions, form the basis of the contract.

"Should there be more or less measure than is here given, there will respectively be an addition to or a deduction from the contract.

"All measurements to be made in the same manner as the quantities have been taken, and all additions and deductions to be priced out at the same rate by the architect."

The contract was signed, and the plaintiffs proceeded with the work.

The defendant appears to have ordered, during the progress of the works, additions to and deductions from the contract.

The case in the Law Reports then proceeds thus—

"The defendant from time to time during the progress of the works, by his certificates, certified that certain sums of money were payable to the plaintiff and Weston in respect of the works executed by them, and gave the same to them, and the said sums, amounting to £10,000, were paid by the company upon the said certificates.

"The plaintiff, after the completion of the works, sent to the defendant accounts in respect of the works executed, showing, as the fact was, that, after adding to the contract the amount of the additions ordered by the defendant, and deducting the amount of the deductions ordered by the defendant, and making the stipulated additions in respect of the said errors in the bill of quantities, and giving the Company credit for the sum of £10,000 paid by them as aforesaid, there remained a balance of £1616 6*s*. 7*d*. unpaid in respect of the works executed, and for which they were entitled to have the defendants' certificate.

"The defendant, without calling upon the plaintiff or Weston for any explanation of the said accounts, and without any communication with them on the subject thereof, made and sent to the plaintiff and to the company his certificate, certifying that the net balance due to the plaintiff over and above the amounts which he had previously certified was £251 14*s*. 4*d*.

Paragraph 17 of the claim sets out that—

"The defendant did not use due care and skill in ascertaining the amounts to be paid by the company to the plaintiff under the said contracts, but, in ascertaining the net balance due to the plaintiff, neglected and refused to ascertain, and did not ascertain, the amount of the said additions to and deductions from the contract in the same manner as the quantities had been measured, and at the same rate as they had been priced out, or that there was more measure in the said description of works than was given in the bill of quantities, by making measurements in the same manner as the quantities had been taken, and neglected and refused to price out, and did not price out, the excess at the same rate, and make the stipulated addition to the contract in respect thereof, according to the terms of the contract; nor did he use due care and skill to ascertain, in the manner provided by the contract, what was in fact the net balance payable to the plaintiff by the company, in respect of the works executed for which the plaintiff was entitled to his certificate,

> but the defendant knowingly or negligently certified as aforesaid for a much less sum than was in fact the net balance payable to the plaintiff in respect of the works executed."

The next objection of the plaintiff is that the defendant refused to furnish plaintiff with the data upon which the certificate was based, and the plaintiff further alleged the defendant refused to give him any information on the subject. And the claim thus continues—

> "The plaintiff thereupon requested the defendant to reconsider the said certificate, and offered to point out to him the said errors in the bill of quantities, and to give him any explanation he might require of the said accounts; but the defendant refused to reconsider the said certificate and to allow the plaintiff to point out to him the said errors in the bill of quantities, or to explain the said accounts, or to hear any objection whatever on the part of the plaintiff to the said certificate."

This seems off-handed treatment, and I fail to call to mind any similar treatment.

The plaintiff alleged—

> "By reason of the premises the plaintiff was unable to obtain payment from the company of the balance, and had been deprived of and had wholly lost the same and the use thereof from the time when he was entitled to the certificate of the defendant for the amount thereof."

The reason the action was brought in one name was, it appears, because there had been a dissolution of partnership.

The plaintiff claimed damages £1364 12*s*. 3*d*., and interest.

THE DEFENCE. I again give the exact words—

> "Demurrer on the ground that the statement of claim showed that the defendant was in the position of an arbitrator, and that he acted, and declared his decision, and the claim did not allege fraud or *mala fides*, and, therefore, showed no cause of action, and on other grounds sufficient to sustain the demurrer."

Now, at the risk of tiring my reader, I give all the arguments and the summing up *in extenso*.

> "*Wills*, *Q.C.* (*Graham* with him), for the defendant. The claim is bad. The action is brought against a person in the position of a quasi-arbitrator, and therefore will not lie: *Pappa* v. *Rose*. There, the quality of raisins sold was left to the opinion of the selling broker. This Court and that of the Exchequer Chamber held that he was a sort of arbitrator, and consequently, was not liable for failing to exercise reasonable care and skill in coming to a decision as to the quality of the fruit, he having acted *bonâ fide* and to the best of his judgment. So likewise an average adjuster, to whom the owners of a ship and the owners of its cargo

referred a question as to the proportion of a loss to be borne by each, has been held to be in the nature of an arbitrator: *Tharsis Sulphur and Copper Company, Limited,* v. *Loftus.* An arbitrator is under no legal duty to use either care or skill.

"[Lord Coleridge, C.J. The position of the architect is peculiar, and is different from that of an average stater or fruit broker. The architect has an interest in reducing the builder's bill.]

"So had the engineer of the defendants' company in *Ranger* v. *Great Western Railway Company,* but the House of Lords held that the plaintiff contractor, who had bound himself to submit to the decision of the engineer, could not complain of his decision. In *Scott* v. *Corporation of Liverpool,* the contractor filed a bill against his employers and their engineer, complaining of undue delay by the latter in awarding the amount earned by the contractor, and sought payment of what was due upon the contract, but did not establish any case of fraud or collusion against the engineer. The bill was dismissed with costs. It is against public policy to allow this action. There is no precedent for it. If it could be maintained attempts would be constantly made to disturb the decisions of those chosen by the parties to fix sums payable. The claim alleges a duty in the architect towards the builder, which must be based on some implied contract. But there is none.

"[Denman, J. There is a duty to be honest. Suppose clear proof were given of a conspiracy between the architect and his employer to defraud the builder?]

"Fraud is not alleged in the present case.

"[Lord Coleridge, C.J. What if the architect has not, in a fair sense of the word, decided at all?]

"He has certified from time to time, and finally. The last certificate being given, the architect was *functus officio,* and was therefore right to decline to give another.

"*Cave, Q.C.,* for the plaintiff. The architect was not an arbitrator or quasi-arbitrator; but if he was, then he has been guilty of misconduct, for which the action will lie.

"First, his duty was simply that of 'measuring up' the work, to ascertain the amount of the additions to or deductions from the contract. This duty was merely ministerial, and such as he might delegate. He, no doubt, did delegate it to a clerk. The plaintiff entered into the contract on the faith that the architect would act upon the terms of it, and measure up according to the prescribed mode. It was to the advantage of the architect that the builder should undertake to carry out his plans, and therefore there was consideration moving from the plaintiff to the defendant for an agreement by the defendant to measure up the works according to the terms of the contract. If asked whether he would undertake to use care and skill when measuring up, he would of course have answered in the affirmative. Whereas an arbitrator does not undertake to use either care or skill, but only to be impartial. Valuation is not arbitration. For instance, an appraisement of hay and repairs which is made for the outgoing or incoming tenants of a farm by valuers between them, need not be stamped as an award: *Leeds* v. *Burrows.* The Courts have indeed somewhat extended the doctrine that protects arbitrators, to quasi-arbitrators, as in Pappa v. Rose. There, however, the broker undertook to give his opinion upon the fruit submitted to him. Moreover, a dispute had arisen. But the function of a mere valuer is not judicial, nor does it become so because two parties employ the same person to value the subject-matter of a contract between them. The architect here was appointed and employed by both parties. Possibly if he had not acted at all, the plaintiff could not have sued him for refusing to do so; but having accepted and entered upon his duties, he undertook to measure the work in the manner specified in the contract, and to bring care, skill, and professional knowledge to the performance of his duty: *Story* v. *Richardson; Jenkins* v. *Betham*. He is liable for a breach of that undertaking.

"Secondly, even assuming that he was a quasi-arbitrator, 'he was bound to exercise his judgment impartially between the contracting parties.' See per Blackburn J., *Pappa* v. *Rose*. It cannot be said that he might even be dishonest with impunity.

"A building owner who colludes with the architect to deprive the builder of a certificate is liable to an action: *Batterbury* v. *Vyse*. And in *Ludbrook* v. *Barrett*, Grove, J., held, on demurrer, that an action would lie by a builder against an architect who fraudulently, and in collusion with the builder's employer, refused to certify, if the architect had an interest in the building contract. Where there is such collusion, there is abundant authority to show that the action can be maintained. See per Erle, C.J., *Clarke* v. *Watson*. The claim alleges that the defendant 'knowingly or negligently' certified for a much less sum than was in fact payable. If he 'knowingly' did so it was a wilful act, whereby the plaintiff was injured. Moreover, a claim may now be made, as this is, in the alternative. So if the architect either wilfully or negligently mismeasured the work the action lies. The plaintiff would be left without remedy if he cannot sue the architect, for his certificate cannot be set aside and another valuer appointed, as this is not an arbitration within the terms of the Common Law Procedure Act (17 & 18 Vict. c. 125, s. 12): *Collins* v. *Collins*. Romilly, M.R., said in that case, 'an arbitration is a reference to the decision of one or more persons . . . of some matter or matters in difference between the parties.' A valuation precludes differences, it does not settle those which have arisen. No dispute has arisen here, no judgment or opinion has been given.

"It was misconduct to refuse to hear the plaintiff, and to reconsider the certificate. The defendant has, in fact, not adjudicated at all. *Ex parte* proceedings before an arbitrator invalidate his award.

"*Wills, Q.C.*, in reply. The builder contracts with his employer on the terms that he shall appoint his own architect to watch over his interests; and that the architect's decision shall be final. He has to decide what are extras, and 'measuring up' requires the exercise of professional judgment. This appears from the contract and bill of quantities, which may be referred to as part of the claim. His certificate is a condition precedent to the contractor's obtaining payment. The architect is employed and paid by the building owner only, and makes no contract either express or implied with the builder.

"The plaintiff has neither alleged nor suggested fraud or collusion by the defendant, and it cannot be inferred from the use in the claim of the word 'knowingly,' which means that he knew what figures he put down and their result, and did not make his calculations by accident or mistake.

"Lord Coleridge, C.J. This is, no doubt, in some sense an action of first impression. If the true view of the case were only as Mr. Cave suggests, viz., that the plaintiff had undertaken to perform certain work under a contract made with a third person, to which the defendant was in terms no party, but that he was aware of and had acted under the contract which had imposed on him the duty of doing certain work requiring no judgment, no opinion, and requiring only the exercise of what I may call ordinary arithmetical powers, and the performance of his duty under that contract was necessary to the plaintiff's right to recover, yet the defendant had refused that duty, then I think the action would lie. But I am not aware that this form of action has ever been maintained. It is certain that in none of the cases cited the supposed duty was of the kind I have described, or the breach of duty was of the sort I have intimated. So, as far as I know, the action would be a fresh action unconcluded by authority, and for the maintenance of which there would be, in my judgment, very good grounds both in sense and law. But I am of opinion that is not the case before us. This claim is for that which has been over and over again attempted without success. It is an action against a man for the negligent performance of a duty, in the doing of which the exercise of judgment or opinion is necessary. Such being the true view of the claim, the cases on that point apply and bind us. Speaking for myself, I entirely approve of them, and think them sound and right.

"The action is by a contractor—not against his employer, but—against the architect of the building owner and, if you please, the architect of the contractor himself, under a contract, the material parts of which are sufficiently set out in the claim. [His Lordship read them.] The work appears to have been done, and during the performance of it the defendant ordered additions to and deductions from the contract. The plaintiff states there were errors in the bill of quantities, and that there was more 'measure' in certain descriptions of work than given in the bill of quantities. That means, I suppose, that under the bill of quantities he had to do more work than he thought he should have to do. It is then alleged that the plaintiff was paid certain sums of money, and that he, after the completion of the works sent—not to the building owner, but—to the defendant accounts, showing a balance for which he was entitled to have the defendant's certificate; that the defendant, without calling on the plaintiff for an explanation or communicating with him, made and sent to the plaintiff and to the company a certificate for a net balance of £251 14*s.* 4*d.* only. On these facts the plaintiff states his cause of action. [His Lordship read it.] Now it is said that the statement of action is of this limited kind; that the only duty cast on the defendant was a purely ministerial and clerkly duty; that he had to make certain arithmetical calculations; and that, if they had been properly made, £1600 was due to the plaintiff; that he did not make and would not make those calculations which were purely arithmetical and called for the exercise of no judgment and demanded no exercise of opinion at all; and that for not doing this purely ministerial duty,.inasmuch as it damaged the plaintiff to the amount of £1364, the action lies. If, as I have already said, that were the true construction—and these paragraphs put the true construction on the contract—I should have been, as at present advised, of opinion that the action would lie, and I say so assuming the right view of the words 'knowingly or negligently' to be that presented to us in the able argument of Mr. Wills, viz., that 'knowingly' does not necessarily mean and must not be taken to mean fraudulently. It is capable of a milder interpretation, viz., that knowing a particular mode of calculation would bring out a certain result, the defendant brought out another, and therefore it was wrong to his knowledge or within his means of knowledge. But when regard is had to the contract, and to the duty to be performed under it, it will be seen plainly that the duty is not merely ministerial or clerkly, and, looking at the contract itself, and the bill of quantities according to which the deductions or additions are to be calculated, it is manifest at a glance that in order to arrive at the amount of additions or deductions a great deal more than arithmetical calculation is necessary. The quality of the work, and the extent to which particular deductions or additions came within particular heads of the bill of quantities, are questions perfectly fit for the determination of an architect; and in many cases it would be necessary and, probably, in all cases actually required that there should be an exercise of considerable professional judgment and skill, and that before the arithmetical result of so many feet of work and so many pounds and shillings for the work could be arrived at, there must be knowledge of the work, familiarity with the bills of quantities, professional understanding to comprehend the technical terms, and judgment to say under which head the deductions or additions ought to be placed. I think, therefore, it is plain when the documents which I am told we must treat as part of the claim are looked at, that although, no doubt, the result is one of figures, yet before it can be arrived at, there must be an exercise of professional knowledge, skill, and judgment. Moreover, it seems to me that it is so provided for by the contract, and that the true view of the contract is that presented by Mr. Wills, viz., that before the plaintiff can recover sums of money from the building owner, there must be the certificate of the architect to ascertain what sums are due from the building owner to the plaintiff. Now, if I have rightly described the position of the defendant with respect to the plaintiff, it follows from the decided cases that this action does not lie. Where, indeed, the building owner and the architect collude together, and in collusion the architect fraudulently abstains from doing his duty towards the builder, there is the authority for saying that he can maintain an action against the building owner: *Batterbury* v. *Vyse*; or the architect: *Ludbrook* v. *Barrett*. It must be left to the Court of Appeal to overrule those cases if they are wrong. They are directly in point, and seem to me founded on clearest sense and justice; but they are not this case, because here neither fraud nor collusion is suggested, unless fraud and *mala fides* be suggested by the word 'knowingly,' which, for reasons already given, I do not think can be, nor does Mr. Cave go so far as to say so. I think this case is within the authority of the cases cited, which decide that where the exercise of judgment or opinion on the part of a third person is necessary between two persons, such as a buyer and seller, and, in the opinion of the seller, that judgment has been exercised wrongly, or improperly, or ignorantly, or negligently, an action will not lie against the person put in that position when such judgment has been wrongly, or improperly, or ignorantly, or negligently exercised.

"I will not discuss the principles on which they rest; it is enough to say that in those judgments pronounced by Courts of co-ordinate jurisdiction, and also in the Exchequer Chamber, I entirely concur, not only on authority, but on grounds of reason and sense.

"Therefore, it seems to me that the first part of the claim is disposed of, and the demurrer must be allowed so far as it applies to paragraph 17. It remains only to consider paragraph 18. I think that what is therein stated is no ground of action at all. There, again, *mala fides* and collusion are not even suggested. It alleges simply that the architect, who is by the contract to form an opinion, and who has formed an opinion, and expressed it, declines to say on what he grounded it, and to hear argument offered to show that the opinion was wrongly formed. I think if his position be such as I have described, he is not bound to give the grounds of his opinion, or to reconsider it, and that the person who has taken him for better and for worse (not as architect, for that is the wrong ground to put the case on, but) as one whose opinion is a condition precedent to the obtaining of a sum of money, cannot bring an action against him for refusing to give the ground of his opinion, or to hear evidence tendered to show that the opinion was wrong. I think that is the better ground to put it on, because I at first thought he might, on a certain view of the facts, be regarded as an arbitrator who had not arbitrated, and that perhaps an action might be maintained (according to obvious analogies), not for doing his duty ill, but for not doing it under any circumstances. But those cases have only been where there has been a dispute between the plaintiff and the building owner, and I doubt whether here any such dispute has arisen. So, assuming that I am right in my supposition that he is made arbitrator between the parties, and on declining to arbitrate could be forced to take upon himself the duty of deciding after reasonable inquiry, I do not think that arises here, for no kind of dispute on the facts before us has arisen.

"The demurrer must be allowed.

"Denman, J. I am of the same opinion. The plaintiff, who is a builder, entered into a contract with the company to erect a large building; and the defendant is the architect who was named in the contract as the person appointed and agreed upon by them to do certain acts without which the plaintiff would not be entitled to the money for his work. There is no direct contract between the plaintiff and the defendant. The defendant does not sign it, and is not made a party by being mentioned in it, except for the purpose for which he was mentioned. But it is contended that he is bound by that contract so as to be liable, either as a person who has contracted to do certain things which he has neglected, or that by virtue of his office he owed a duty to the plaintiff which he has neglected. I am not prepared to say that it is impossible to conceive a case in which he might not be liable on the contract itself, knowing that he is named in it, and accepting the duties under it, and receiving certain benefits out of it, as in every case where an architect is employed. A case is conceivable where, by acting under a contract, he might become so far a party as to be liable either under the contract, or in respect of rights and duties arising by reason of the office assumed, which would give a right of action to either party. But supposing a duty does arise, the question is what is the amount of the duty? It appears to me that he does not, by undertaking the office of arbitrator, undertake any duty amounting to more than that of honestly performing his functions.

"Suppose the case alleged that the defendant, having undertaken the office of architect and arbitrator between the building owner and the contractor, fraudulently or corruptly, or in collusion with the building owner, dishonestly took a course which he ought not to have taken, and so injured the plaintiff, I have, as at present advised, no doubt whatever that an action might have lain against him. There are many dicta to that effect. But the question is, what duty did he here undertake? That depends on the nature of the employment of an architect who acts under a contract of this kind. I do not intend to hold that he is to all intents and purposes an arbitrator, but I think that his duties are very analogous to the duties of an arbitrator, and are quite as much so as were those of the defendant in *Pappa* v. *Rose* or *Tharsis Sulphur and Copper Company, Limited*, v. *Loftus*. The argument of Mr. Cave is that under the present contract the architect was not an arbitrator or a person appointed by the parties to decide questions requiring exercise of discretion, skill, or, in one sense, judgment at all, but was a kind of appraiser or valuer, to look at certain work, cast up certain figures, and do rather clerkly than judicial work, or the work of an arbitrator, which requires the exercise of skill and judgment. So to hold would be to ignore the experience of every member of the bar and bench who has had to do with building contracts, and as very many of us have had great experience of them we ought to take it into consideration. We know that it frequently happens in references that there will be skilled architects called on one side and on the other, who very often honestly differ as to the proper mode of measuring up, and disagree to the extent of hundreds of pounds as to what is owing under a bill of quantities. This appears to me enough to show that an architect is not to be dealt with as a mere caster-up of figures, who, if he makes a mistake, is to be looked upon as guilty of negligence because he has cast them up wrongly, but as one having to do something requiring judgment, discretion, and skill, and I think that he is a person exercising very important functions requiring skill and judgment in cases of this kind. That being so, *Pappa* v. *Rose* and *Tharsis Sulphur Company, Limited*, v. *Loftus* apply. The only distinction pointed out by Mr. Cave was that in one case an actual dispute had arisen, and therefore the defendant was an arbitrator, whereas he might not be so before a dispute. But it seems to me that the architect is an arbitrator from the beginning to the end of the contract; he is throughout to have his eye on the work, and give certificates from time to time, all having reference to his final certificate, and, unless he gave the duty up altogether from the first appointment, he is from the first a person exercising judgment on a matter on which the parties cannot exercise judgment.

"I think, therefore, that the parties have trusted to him, and that from the beginning he must exercise his functions fairly and honestly between them, and that if he violates that duty he is liable to an action. If he honestly performs them then he honestly performs his bargain, if it be a bargain, or his duty, if it be a duty, arising from the acceptance of the functions, and the parties must abide by it. But it is said that paragraph 17 carries the case further, because it alleges that the defendant 'knowingly or negligently' certified for a much less sum than was in fact due. It would, I think, be a bad precedent were we to hold that by cramming into the claim such a word as that, it could be expanded into meaning 'fraudulently, dishonestly, and corruptly,' charges quite different from what was here intended. But I think that word 'knowingly' equivalent to 'knowing the figures put down.' It would have been easy, if necessary, to use the words 'fraudulently and corruptly.' Paragraph 18 remains to be considered. The answer to the contention in it appears to me to be that the defendant would have done very wrong if he had, at the mere request of the plaintiff, and without any dispute having arisen between the parties, but on the complaint of the plaintiff alone, reopened the matter and determined to reconsider his certificate. No dispute had arisen between the parties. The only dispute which had arisen was between him and the builder, and all that appears was that the builder was dissatisfied with the certificate. I think that claim, also, is ill-founded, and that our judgment should be for the defendant."

A point that will sometimes arise is set forth in the well-known case *Gwyther* v. *Gaze*, in 1875. Here Mr. Gwyther prepared, by instructions from the architect engaged, quantities. Tenders were received based on these quantities, but none accepted. The architect reduced the height of his building, and some other builder had the contract. It does not appear very clear why the original builders were not asked to tender again for the reduced building; but I gather from the report that they were not. Not unnaturally, Mr. Gwyther wanted payment, but the building owner does not appear to have been willing to pay for his services, and so he had to bring an action for his usual percentage of 2½ per cent. on the lowest tender, the demand being in the usual way. Oddly, Mr. Justice Quain thought a difference should be made between the cost of the preparation of quantities where one of the tenders was accepted and where no tender was.

Now can any one imagine a more fallacious doctrine? and one is surprised that so careful and learned a judge should have propounded so novel a doctrine. The quantities could cost the surveyor no more labour whether the tender is accepted or not, and yet his lordship's decision was that if a tender is accepted, then 2½ per cent. on the lowest tender is fair—this being really, of course, the charge sanctioned by usage; but that 1½ per cent.—how his lordship arrived at this percentage does not appear—would be sufficient if from any cause (so it would appear) the building owner refused to accept the lowest or any tender.

A recent case in which I was consulted is *Waghorn* v.

Wimbledon Board of Health, in the year 1877. In this matter the surveyor to this Board had prepared plan, by order of the Board, for cemetery chapels; and Mr. Rowell, having prepared the drawings without consulting the Board, instructed the quantity surveyor to prepare quantities, and thereafter tenders were received. The lowest tender being beyond the contemplated outlay, all tenders were declined. Some time after, the demand was made by the quantity surveyor for payment. The Board's reply and pleading was that they had never authorized Mr. Rowell to employ the quantity surveyor.

The ruling was that as the Board had instructed their surveyor to obtain tenders, they had therefore authorized him to have quantities taken out on the ground that tenders could not be made without quantities.

Curiously enough, my designs were accepted—received in open competition—and these chapels, mortuary and lodge, are now built therefrom.

The ruling in the case *Taylor* v. *Hull* ought to be mentioned, although the case is about ten years old.

Chief Justice Monahan said—

> "That according to the usage of the trade, if the owner discarded the architect's plan, he was liable to the surveyor, the architect having the express or implied authority of the owner to employ him; that the builder who carried out the new plan, though he might have tendered under the old plan, was not liable if he did not use the surveyor's calculations; and that the contract here, not being any modification or continuation of the original contract which was in negotiation with defendant, but an entirely new independent contract by the present defendant in his own right, he was not liable. The uncontradicted evidence of his foreman, who acted for him, being that the plaintiff's calculations were not used,
>
> "*Held*, that surveyor could not recover for the quantities."

Care should be taken by the architect to disclose to the surveyor he asks to prepare the quantities the name of his employer, and, in fact, the best plan is to put in writing all the particulars, because the case *Burnell* v. *Ellis*, in the year 1866, shows that without such precaution the architect may make himself personally liable. In that case the tenders received were all refused, as being too high, and the intention of the company to build abandoned, and then the surveyor who had prepared the quantities claimed from the architect £100, reducing the amount to £50 as the works did not proceed, and obtained a verdict for that amount.

Now, an architect by his conduct may prevent the surveyors who take out the quantities having any claim against the principals. I cite the well-known case of *Richardson and Waghorn* v. *Reales and others.* In this case the plaintiffs, the quantity surveyors, had to submit to a nonsuit because the architect stated that he had received a communication from the committee, accepting his design, and informing him that he might obtain tenders, but in so doing he must not pledge the committee in any way.

The recent case of *Gordon* v. *Blackburne* favours the assumption that the architect must pay for quantities unless he takes care to disclose principal. In that case Mr. Gordon had seen only Mr. Blackburne. The drawings did not inform Mr. Gordon who the principal was. He had had previous transactions with the architect, and received payment from him direct. The judge appears, in his summing up, to have asked the jury to say whether there was anything differing from the usual position of architect and quantity surveyor, as, if not, the verdict must be for the architect; if there was, however, a personal employment of the quantity surveyor and a promise to pay, the architect would be liable.

The jury decided the architect had personally employed the quantity surveyor.

As to when the builder is to pay if the decision in the case *McConnell* v. *Kilgallen*, 2 Irish C. L. R., 119, 1878, is upheld in the future makes the time of payment directly the contract is accepted, and this although there may be a stipulation in such contract that the commission is to be paid out of the first instalment. In this case, however, it should be borne in mind that it was the action of the contractor in abandoning the job that prevented any first instalment ever being paid, so that we may assume that in ordinary cases the contract would determine the time of payment, and that this decision only relates to those cases where no first instalment is ever paid. Then as to the payment of quantity surveyors for other work done by them in connection with the preparation of the bills of quantities, in the recent case heard in October 1887, *Schofield* v. *Barnardo and Gregg*, the surveyor claimed for the preparation of specification, and for repayment of moneys he had expended to have the iron girders tested, and for going to the premises to take measurements of old buildings. I was called on behalf of Dr. Barnardo, and in my evidence gave that the quantity surveyor was not entitled to charge the architect's client for these works. The jury in their verdict agreed to this view.

The much-vexed question that surveyors who take out quantities have to consider is—If quantities are deficient, are they liable to the builder?

Before treating of this let me mention the unusual case of *Scargill* v. *Shoppee and another*. Here the case was the gentleman who had the mansion built suing, under the advice of his architect, the quantity surveyors for *excessive* quantities.

As I was engaged in this case for the defendants, and they were successful, I will only say that a very careful examination of the drawings and specifications enabled me to say that there was no just cause of action against them. Oddly enough, only a few months before this action was brought, an action was threatened against the same defendant by the builder for deficient quantities.

Now, as to action for deficient quantities, I have already said elsewhere that the fear of such actions does in some cases induce the quantity surveyor to *weight*—that is the expression—his quantities to prevent such actions.

This is not just to the employer, however, as he thereby pays more for the building, and virtually pays the insurance money, small or great, according to the timidity of the quantity surveyor. This is not just, and I am sure by calling attention to this I shall do good service, not only to the employer, but also to all branches of my profession.

Why is it employers so often refuse to have quantities? They will tell you the reason is that where quantities are taken out the building costs so much more.

It would appear that if quantities are short, the builder's only remedy is against the surveyor who takes out the quantities, and not against the employer.

The case *Scrivener and another* v. *Park* is a case in point.

To sum up, it may be said that he who pays for the quantities has a remedy against him who prepared them. There must in law be a payment for work done to enable a person to complain of that work. If, therefore, the successful builder pays for the quantities and they are short—he is *not* likely to complain if they are full—it would appear he has his remedy, unless something has been said or written to exonerate the surveyor who took out the quantities.

The cases that decide the mere employment of an architect to prepare designs is sufficient authority for him to engage the services of a surveyor to work out quantities, are *Moon* v. *Guardians of Witney Union*, and *Rowell* v. *Wimbledon Local Board*. In the latter case I was consulted. The cases were decided in favour of the quantity surveyor, on the ground that the *usage* was for architects to instruct without any direct authority from their clients; but in one of the cases the victory rested on technical grounds with the Board, they setting up the defence—not under seal.

With regard to measuring up at the final settlement, the case reported in the *Builder* of 2nd July, 1887, should be borne in mind. In *Inery* v. *Pawson and Brailsford*, which although only a County Court decision, has the advantage of being the decision of that able judge Ellison, shortly the case was an action brought to recover commission for quantities. The plaintiff claimed one sum of £22 5*s.* and another of £75 8*s.*, together £97 13*s.* The defendants had paid into court £53 2*s.* and £3 3*s.* costs and that, they said, was all that they were liable for; the real point at issue, however, was whether the defendants were liable to the plaintiff or Messrs. Longdon (the contractors). The case was entered for hearing in a superior court, but the defendants had paid the £53 2*s.* in order to bring the action within the jurisdiction of the County Court, and not because they admitted their liability for any part of the sum claimed.

The contractors in evidence stated that they had paid the

2 per cent. for the quantities on which the contract was taken, but had not paid a claim from the plaintiff for £103 dated 5th January, 1886, because when the work was measured up the proprietors always paid the commission on additions and omissions unless the amount was added to the builder's account. The builder did not pay on measuring up unless he received it from the proprietors. They did not receive it from the proprietors. The architect stated that the quantity surveyor was engaged with the defendant's sanction to prepare the quantities for the new building, and that his certificates were given for the amount due "pro rata" according to the contract, and including what was due to the quantity surveyor, but the amount was not specified. He dealt with the commission on the omissions and additions in a final certificate to the contractors. It was then specifically arranged that the sum of £103, the commission due to the plaintiff on these items, should be paid by the defendants, and he withheld his final certificate until that arrangement had been accepted by the solicitors on each side, and he never called upon the contractors to pay it. After hearing the evidence of the defendant the judge said he thought the evidence that had been called was in favour of the plaintiff; although called on behalf of the defendants it had entirely failed to support the case, and he therefore directed the jury to find a verdict for the amount claimed, with the sum paid into court, which was done.

In conclusion, let me say that it is wiser and safer to have a clear understanding with your client before having the quantities taken out; there can then no legal question arise as to whose duty it is to pay for them.

CHAPTER XXI.

EXAMPLES OF TAKING OFF.

Taking Off Brickwork of the Front of a Detached House—Measurements repeated to make Examples simpler—Example of Taking Off the whole of the Interior Work to the Drawing-room—Joists—Sleepers—Flooring—Skirting—Architraves—Doors—Hinges—Locks—Finger Plates—Jamb Linings—Framed Grounds—Lintels—Relieving Arches—Wood Bricks—Sashes and Frames—Sash Lifts and Pull-down Handles—Groove—Glass—Plastering—Paper—Tile Hearth—Marble Fenders—Stove—Mantel-piece—Cornice Centre Flower—Cement Angles—Measurements on these Examples, taken from the Lithographed Plates.

AS mentioned in my preface, the only suggestion made in reply to my numerous inquiries as to whether I could make this book more useful is that an example of taking off from a complete plan would make it easier to the beginner.

I have therefore in this chapter given two examples:—

i. Example of taking off the brickwork of the front of a detached villa.

ii. Example of taking off the interior work to the drawing-room of the same villa.

In taking off the measurements, I have purposely repeated each item instead of making collections of them. The latter course would have given fewer dimensions, but my object has been to keep it as simple as possible, so that the reader may follow item by item.

In the second example I have not taken the brickwork, as this would be a repetition; but the deductions of brickwork for windows and doors appear in their regular order.

1.—EXAMPLE OF TAKING OFF THE BRICKWORK OF THE FRONT OF A DETACHED VILLA (as shown in the plates which follow this Chapter).

			1st course .. 2 B. 2nd „ .. 2½ B. 3rd „ .. 3 B. 3)7½ 2½ average.
	25·6 9	2½ B. footings basement.	

Example of taking off Brickwork—*continued.*

	25·6 9·9	1½ B. wall to ground floor.	
	12·0 9	Ddt. 2½ B. want footings. Bay.	
	12·0 9·9	Ddt. 1½ B. want bay to ground floor.	
	15·3 6	1¾ B. footings bay, collected. 1st course .. 1½ B. 2nd „ .. 2 B. 2)3½ 1¾ average.	2/4 6 9·0 6·3 15·3
	15·3 9·9	1 B. wall to ground floor.	
2/	9·9	Rough-cut squint quoin, Internal angles to ground floor.	
2/	7·9	Add external angles to ground line.	
2/	9·9	Rough-cut birdsmouth, Internal to ground floor.	
2/	7·9	Add external to ground line.	
	16·9 9	2½ B. footings, drawing-room.	
	16·9 3·9	1½ B. wall to ground floor.	
	12·0 9	Ddt. 2½ B. footings. Bay.	

Example of taking off Brickwork—*continued.*

	12·0 3·9	Ddt. 1½ B. want bay to ground floor.
	15·3 6	1¾ B. footings. Bay *a b*.
	15·3 3·9	1 B. wall to ground floor.
2/	3·9	Rough-cut squint *a b*.
2/	1·9	Add external angles.
2/	3·9	Rough-cut birdsmouth *a b*.
2/	1·9	Add external angles.
	42·3 23·2	1½ B. wall .. .. 11·9 Joists, &c. 0·11 10·6 From ground to second floor .. 23·2
2/	12·0 23·2	Ddt. 1½ B. want for bays.
	6·9 10·9	Ddt. 1½ B. porch, and ddt. facings of best red bricks.
2/	1·2 10·9	Add facings only, reveals.
2/	15·3 24·6	1 B. wall .. .. 23·2 1·4 Bays all up.
2/2	24·6	Rough-cut squint, internal angles from ground floor.

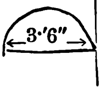
Example of taking off Brickwork—*continued.*

2/2	24·6	Rough-cut birdsmouth.	
2/2	26·3	Fair-cut squint, external angles from ground line.	
2/2	26·3	Ditto birdsmouth.	
2/2	2·0 9·3	Ddt. ½ B., and ddt. facings of best red bricks, outer reveals, side lights of bays, ground floor.	
2/2/2	4½ 9·9	Add facings only reveals.	
			2·0 2/4½" 9 2·9 9·3 3 9·6
2/2	2·9 9·6	Ddt. ½ B., inner reveals.	
2/	5·3 9·3	Ddt. ½ B., and ddt. facings *a b*, outer reveals, centre lights.	
2/2	4½ 9·3	Add facings, only reveals.	
			5·3 9·4 2/4½ 9 3 6·0 9·6
2/	6·0 9·6	Ddt. ½ B., inner reveals.	

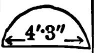
Example of taking off Brickwork—*continued.*

		2·0 3 2·3
2/2	2·3 1·3	Extra only to gauged arches in best red bricks set in putty, and ddt. facings, side lights (ground floor).
2/2	2·0 4½	Add arch only, soffite.
2/2/2	1·4 4½	Rough cutting to skewbacks.
2/2/2	1·4	Fair cutting to facings.
2/	5·6 1·3	Arch *a b*, and ddt. facings, centre lights.
2/	5·3 4½	Add arch only, soffite.
2/2	1·4 4½	Rough cutting *a b*.
2/2	1·4	Fair cutting.
2/2	2·0 7·0	Ddt. ½ B., and ddt. facings *a b*, outer reveals, side lights of bays (first floor).
2/2/2	4½ 7·0	Add facings only, reveals.
		2·0 7·0 2/4½" 9 3 2·9 7·3
2/2	2·9 7·3	Ddt. ½ B., inner reveals.

Example of taking off Brickwork—*continued.*

2/	5·3 7·0	Ddt. ½ B., and ddt. facings, outer reveals, centre lights.
2/2	4½ 7·0	Add facings only, reveals.
2/	6·0 7·3	Ddt. ½ B., inner reveals.
2/2	2·3 1·0	Arch *a b*, and ddt. facings, side lights (first floor).
2/2	2·0 4½	Add arch only, soffite.
2/2/2	1·1 4½	Rough cutting *a b*.
2/2/2	1·1	Fair cutting.
2/	5·6 1·0	Arch *a b*, and ddt. facings, centre.
2/	5·3 4½	Add arch only, soffite.
2/2	1·1 4½	Rough cutting *a b*.
2/2	1·1	Fair cutting.
	3·6 8·0	Ddt. 1 B., and ddt. facings, outer reveal, window over porch to springing of arch
		Ddt. ditto, circular head.

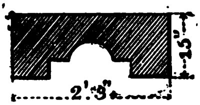
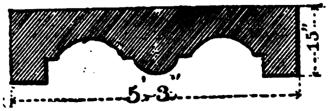
Example of taking off Brickwork—*continued.*

2/	9 8·0	Add facings, reveals.	
	4·3 8·3	Ddt. ½ B., inner reveal.	
		Ddt. ditto, circular head.	
	8·6 1·0	Arch *a b*, but semicircular, and ddt. facings.	
	7·0 9	Add arch only, soffite.	
	10·0 9	Circular rough cutting to arch.	
	10·0	Circular fair cutting, facings.	
	42·3 6·4	1 B. wall (2nd floor) to eaves gutter.	
2/	8·4 2·6	Add, *above roof*, side pediments.	
	8·6 4·0	Add centre to caps of pilasters (stone above this height).	
	3·4 2·6	Ddt. 1 B. and facings. Stone base to oriel averaged.	6·0 9 2)6·9 3·4½
	6·0 4·0	Ddt. ditto, oriel.	

Example of taking off Brickwork—*continued.*

2/	1·2 8·3	Ddt. ½ B., and ddt. facings. Stone pilasters.	
			2/4·0 8·0 2/2·6 5·0 13·0
	13·0 1·3	Ddt. 1 B., and ddt. facings main cornice (stone string courses, sills, &c., not deducted).	
2/	5·9 5·9	Ddt. ½ B., and ddt. facings. Outer reveals (2nd floor windows).	
2/2	5·9 4½	Add facings only, reveals.	
2/	6·6 6·0	Ddt. ½ B. inner reveals.	
2/	6·0 1·0	Arch *a b* (not circular), and ddt. facings.	
2/	5·9 4½	Add arch only, soffite.	
2/2	1·1 4½	Rough-cutting skewbacks.	
2/2	1·1	Fair-cutting facings.	
	42·3 31·6	Extra only to facing with the best red bricks and tuck pointing.	
2/	8·6 2·6	Add side pediments.	
	8·6 4·0	Add centre.	

Example of taking off Brickwork—*continued.*

	4·0 2·0	Ddt. roof of oriel.	
2/	12·0 26·3	Ddt. want bays.	
2/	14·0 26·3	Add bays collected.	2/3·9 7·6 6·6 14·0
2/2	1	Extra labour and materials in forming cut and rubbed plinths in red bricks as sketch, 1¼" projection (under window-sills), ground floor side. 	
2/	1	Ditto, ditto, but as sketch, centre. 	
2/2	1	Labour only to forming sunk panels 1¼" deep in red bricks, size 2' 3" × 1' 3".	
2/	1	Ditto, ditto, but 5' 3" × 1' 3"	
	19·0 1·2	Damp course, formed of double course of stout slates bedded in cement.	2/3·0 6·0 13·0 19·0
2/	15·3 9	Add bays.	
2/3	19·0	1¼" × $\frac{1}{16}$" hoop iron band, well tarred and sanded, and laying in walls (14" walls).	

Example of taking off Brickwork—*continued.*

2/2/2	15·3	Add bays.	
2/	42·3	Add 9″ walls (second floor).	

The following items, although they would not appear in the taking-off of the Bricklayer (but under the different trades), would be transferred to the Bricklayer's bill, and I therefore give the list:—

	3	Very large frames, bedded and pointed in lime and hair.	
	6	Large ditto.	
	8	Frames ditto.	
	12	Sills made good to.	3 3 3 3 12
4/	2	Ends stone steps, cut and pinned in wall.	

II.—EXAMPLE OF TAKING OFF THE INTERIOR WORK TO THE DRAWING-ROOM OF A DETACHED VILLA (as shown in the Plates which follow this Chapter).

	15·6 29·0	1¼″ yellow batten straight joint flooring, ploughed and tongued with iron tongues. Drawing-room.	
	9·0 3·0	Add bay averaged	12·0 6·0 2)18.0 9·0

Example of taking off Interior Work—*continued.*

2/	4·3 3	Add raking cutting to sides of bay.	
	9 5·4	Ddt. chimney breast	3·0 1·2 1·2 5·4
	1·6 4·6	Ddt. hearth	3·0 9 9 4·6
2/	1·0 3	Add cutting to splayed angles of fender.	
	8·6	Extra only to glued and mitred border to 1¼" flooring.	1·6 1·6 1 0 1·0 3·6 8·6
	82·0	1¼" deal sunk and moulded skirting 12" high, including all necessary grounds and backings, and plugging to wall.	11·9 9 9 11·9 15·6 8·0 7·0 8·0 2·0 4·3 6·0 4·3 2·0
		Collected	82·0
	10	Tongued and mitred angles.	
	4	Ends housed to architraves.	

Example of taking off Interior Work—*continued.*

	2	Ends fitted to mantel.	
2/	3·0 7·0	2" deal six panel moulded both sides doors, and ④, and ddt. 1 B.	
		Note—All painting to be in party colours of approved tints.	
2/	1½	Pairs 3" best brass butts.	
2/	1	6" best mortice locks, with black and gold furniture one side and white and gold the other.	
2/	1	Long white and gold porcelain finger-plates.	
2/	1	Short ditto.	
2/	1	Long black and gold ditto.	
2/	1	Short ditto.	
2/	17·5 11	1¼" deal double rebated and double-beaded jamb linings and soffites, and ④.	7·0 7·0 3·0 4/1¼" 5 17·5
2/	18·11 4½	1" deal wrought and framed grounds and ④	17·5 4/4½ 1·6 18·11
2/	20·7	5" deal moulded architraves, including mitres.	18·11 4/5" 1·8 20·7

Example of taking off Interior Work—*continued.*

2/	4·6 9 3	Fir lintel.	3·0 9 9 4·6
2/	1	Extra only to rough relieving arches in 2 half-brick runs in cement, 3 ft. opening and 9″ soffite.	
2/	6	Wood bricks.	
2/	3·9 6·7	Ddt. R. F. and S. walls, and paper P. C. 6/- per piece.	3·0 7·0 2/4½″ 9 4½ 3·9 7·4½ 9 6·7½
	6·0 9·7	Deal-cased frames, oak sunk and weathered sills, and 1¾ ovolo moulded sashes double hung with brass axle pullies, patent lines, and lead weights, centre window.	5·3 9·0 2/4½″ 9 7 6·0 9·7
	1	Hopkinson's 3″ best patent brass sash-fastener with white knob.	
	2	Brass sunk sash lifts.	
	2	Best brass pull down handles.	
	6·0	1¼″ × ⅛″ wrought iron tongue and white lead.	
	6·0	Groove in oak.	

Example of taking off Interior Work—*continued.*

	6·0	Groove in Portland stone.	
	5·1 4·7	¼" best British polished plate glass, lower sash, 1 square.	
2/	2·6 2·7	Add upper sash.	
2/	3·6	Circular cutting and risk.	
4/	1·3 1·9	Glass as above, but with bevelled edges.	
	26·8 4½	1" grounds *a b* and ④.	9·7 9·7 6·0 4/4½" 1·6 26·8
	28·4	Architrave and ④.	26·8 4/5" 1·8 28·4
	12·0	1¼' × 3" deal wrought and rounded window nosing tongued to sill, and ④ collected.	3·0 6·0 3·0 12·0
	2	Returned and rounded ends.	
	2	Mitred angles.	

Example of taking off Interior Work—*continued.*

	6·9 4½ 3	Lintel.	5·3 9 9 6·9
	1	Rough arch *a b* but 5′ 3″ opening, and 4½″ soffite.	
	1	Very large frame bedded and pointed in lime and hair.	5·3 9·3 9 4½ 6·0 9·7½
	6·0 9·7	Ddt. R. F. and S. walls, and paper P. C. 6/- per piece and ½ B. inner reveal.	
	5·3 9·4	Ddt ½ B., outer reveal and red brick facings.	
2/	4½ 9·4	Add facings only, reveals.	
2/	2·9 9·7	Deal-cased frames, &c., and *a b* sides.	2/4½″
2/	1	Sash fasteners.	
2/	2	Sash lifts.	
2/	2	Brass handles.	
2/	2·9	Wrought iron tongue.	

Example of taking off Work—*continued.*

2/	2·9	Groove in oak.	
2/	2·9	Groove in Portland stone.	
2/	1·10 4·7	Glass, lower sash, 1 square.	
2/	1·10 2·7	Add upper sash.	
2/	2·6	Circular cut and risk.	
2/2	·11 1·9	Glass with bevelled edges.	
2/	23·5 4½	Grounds *a b* and ④.	9·7 9·7 2·9 4/4½″ 1·6 23·5
2/	25·1	Architrave and ④.	23·5 1·8 25·1
2/	3·6 4½ 3	Lintel.	2·0 9 9 3·6
2/	1	Rough arches *a b*, but 2′ opening.	
2/	1	Bed and point frames.	

Example of taking off Work—*continued.*

2/	2·9 9·7	Ddt. R. F. and S. walls, and paper P. C. 6/- per piece and ½ B., inner reveal.	
2/	2·0 9·4	Ddt. ½ B., outer reveal, and red facings.	
2/2	4½ 9·4	Add facings only, reveals.	7·6 7·6 Tenons .. .. 8 Stubs .. .. 4 3·3 Frame .. .. 8 Horns .. .. 6 20·5
2/	20·5 4 4	For proper casement frame and ④. Casements in flank wall.	3·3 8 3·11
2/	3·11	4½″ × 4″ wrought, rebated, and four times beaded transom, and ④.	
2/	3·11	9″ × 3″ oak sunk and weathered sill.	
2/	3·3 7·6	2″ deal ovolo, moulded fined casements, measured to outside.	
2/	3·3	Iron tongue.	
2/	3·3	Groove in oak.	
2/	3·3	Ditto in York stone.	
2/	3·1 5·6	Cathedral glass of selected tints and glazing in stout lead quarries, secured to saddle-bars with strong copper bands.	

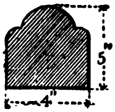
Example of taking off Work—*continued.*

2/	3·1 1·10	Add above transom	
2/3	3·1	½" round galvanized iron saddle-bars.	
2/	19·9 4½	Grounds *a b* and ④.	7·6 7·6 3·3 4/4½" 1·6 19·9
2/	21·5	Architrave and ④.	19·9 4/5" 1·8 21·5
2/	4·9 4½ 3	Lintel.	3·3 9 9 4·9
2/	1	Rough arches *a b*, but to 3′ 3″ opening.	
2/	1	Bed and point frames.	
2/	4·0 7·6	Ddt. R. F. and S. walls, and paper *a b* and ½ B., inner reveal.	
2/	3·3 7·3	Ddt. 1 B., outer reveal and *picked stock* facings.	
2/2	9 7·3	Add facings only, reveals.	
21/	16·3 4 2½	Ground joists.	15·6 4½ 4½ 16·3

Example of taking off Work—*continued.*

4/	13·6 4 2½	Add shorter lengths. Hearth deducted.	16·3 2·9 13·6
	5·6 4 3	Add trimmer.	
2/	16·3 4 ½	Add extra thickness trimming joists.	
	10·3 4 2½	Add bay.	9·6 4½ 4½ 10·3
	7·9 4 2½	Add bay.	7·0 4½ 4½ 7·9
	66·6 4½ 3	Plates collected.	11·9 11·9 29·0 4·0 4·0 Angles .. .. 4·0 Laps .. .. 2·0 66·6
	32·0 4½ 3	Sleeper.	
	1·2 3·0	Ornamental tile hearth, P. C. 5/- ft. (pattern to be selected), laid on and *including* bed of fine concrete brought to a level face (measured net), back hearth.	

Example of taking off Work—*continued.*

1·6 4·0	Add front hearth.	
2	Splayed cuttings to tiles, 6″ long.	
2	Notchings for chimney-piece.	
8·0	5″ × 4″ polished on three sides and moulded white marble fender, as sketch, and setting in cement. 	1·6 1·6 9 9 3·6 8·0
2	Extra only to splayed angles to ditto, 9″ long.	
2	Ends made good to mantel with cement.	
1	Register stove, P.C. 1/ per inch, to opening 3 ft. wide.	
1	Stove set.	
1	Flue cored.	
3·0 3·0	Ddt. 1½ B. and R. F. and S. walls and Paper P. C. 6/- per piece, chy. opening.	
4·6	2″ × ⅜″ chimney bar, and fix same.	3·0 9 9 4·6

Example of taking off Work—*continued.*

1	Terra-cotta chimney pot 2' high, and set and flaunch in cement.	
1	Marble mantel-piece, P. C. £10 (to be selected by the proprietor), and provide for carriage, profit, and fixing in addition.	
1	Make good plastering round mantel.	
		15·6 Ddt. cornice 9 14·9 29·0 Ddt. cornice 9 28·3
14·9 28·3	Lath, plaster, float, and set ceiling, and twice whiten.	
9·0 3·0	Add bay, averaged.	
·9 5·4	Ddt. chy. bst.	
91·6 1·6	Plaster moulded cornice, collected.	29·0 9 9 15·6 29·0 2·0 4·0 6·0 4·0 2·0 Round of room .. .. 93·0 Cornice (twice projection) .. 1·6 91·6
6	Internal mitres to ditto.	
2	Ditto, on splay.	

Example of taking off Work—*continued.*

	2	External mitres.
	2	Ditto, on splay.
	91·6	Plaster enrichment 4" girth, including modelling (detail will be supplied).
	12	Mitres to ditto.
	1	Plaster enriched centre flower 2′6″ diameter, P. C. £2, and fix complete and clearcole and distemper to an approved tint.
		Total height .. 11·9 Skirting .. .. 9 11·0
	93·0 11·0	Render, float, and set walls, and paper, P. C. 6/- per piece.
4/	11·0	Keene's cement angled chy. joints, and angles of bay.

I do not give the abstract and fair bill of the foregoing dimensions because my readers who have studied the previous pages will be able to form their own abstract and fair bill; as to the latter the form with preamble is given on pages 139 to 149.

CHAPTER XXII.

RÉSUMÉ AND CONCLUSION.

RECAPITULATION—ATTENTION DRAWN TO THE SUBJECT—ASSISTANCE TO STUDENTS—UNIFORMITY TO BE DESIRED—REFERENCE WORK—TABULATED FORM—ASSISTANCE TO SURVEYOR—SYSTEM—WANT OF CARE—INSTANCE OF OMISSIONS—DESIGN—QUANTITIES SAFER—PAY WELL.

LAND at last! How I can sympathize with the expression! The yearnings of the sailor for land and home can scarcely exceed in intensity the feelings for ***Finis*** which a writer on a strictly technical subject has.

Of course the prosaic will say, Why write at all? or, at all events, consider the payment you receive its equivalent.

Yet I venture to think my readers will judge otherwise. They will appreciate the efforts that I have made to render this work a *text*-book on the subject, to be referred to at all times. First, however, let me recapitulate the objects I have had in view:—

1st. The drawing attention to this particular subject, which has been, and is, much neglected.

2nd. Enabling students, in the most concise and easy method, to acquire this branch of the profession.

3rd. To bring, what I venture to consider, the true practice before the large and rising body of the profession, that it may be criticized, and in the result we shall obtain uniformity, which, I am sure, all must desire.

4th. To make a work of reference for the maturer members. At present there is no work which can be called a text-book or guide.

5th. By the use of the tabulated form to render these pages most easy of reference; and for economy of space I have made my Tables answer a double purpose.

I may mention I have used this tabulated method from the great success which has attended (even beyond my expectations) the same principle which I first adopted in "Dilapidations."

There can be no doubt, I opine, that the most careful quantity surveyor will find an advantage in having these Tables before him; it will prevent his missing any item, and this being the case, how much greater must be the advantage to the less experienced man! It is to such an one almost his alpha and omega.

Never, probably, could the reply of that celebrated man, who, when asked how it was that he accomplished so much, made answer, "System, sir—system," be more appropriate than here. No subject requires it more; and it is only by system and method that the most experienced surveyor can hope to avoid *omissions.*

What a fruitful subject that one word suggests—the looming in the future of actions by builders because our quantity surveyor had omitted an item.* Marvellous is it that nowadays there is not one profession which is not threatened, at some time or other, with the strong arm of the law. We have just shown that the quantity surveyor is not free. The architect and the surveyor I need scarcely mention, as all my readers well know the liabilities we are exposed to; the lawyer (with him we, perhaps, have less sympathy), the auctioneer, the medical man, &c.—scarcely a week passes that you do not read in the papers of some action for want of *due caution* or want of *proper skill,* and where, in consequence, compensation is claimed in the action against the professional man.

If my reader has carefully gone through these papers, and will refer to the Tables on all occasions, I believe he will be master of the subject, and that no matter of what building he has to take out the quantities, he will be able to do so in a satisfactory manner; in fact, he will find a pleasure in his work, and even sigh for some more difficult building. None can I mention, except the fancy of the poet, which must estop the energy of the *quantity surveyor*. Imagine the quantities required of the following, with prices:—

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* I well remember two instances of important omissions by different quantity surveyors, both men of experience—one case where the whole of the sleeper walls were omitted in the quantities of a large public building; the other where the surveyor omitted the figure 2 before the dimensions, thereby entirely omitting *one wing* of the hospital.

"Build the entrance high and proud,
Darkening and eke brightening,
Of a riven thunder-cloud
Veined with lightning.
Use one with an iris-stain,
For the door within,
Turning to a sound like rain,
As we enter in."

I mention this to show the "*practical*" man that there is a limit to his sphere, and when he can most fully accomplish "dilapidations" and "quantities," he need not rest content, but may essay the higher and more poetic—namely, designing. Should he do so, he must remember that he will have fewer rules to guide him; that he will leave firm ground, and be entirely at sea (in more senses than one); that what one critic will admire, another (of a different school) will condemn; that beauty and novelty will not atone for the design being of the wrong school. By wrong, I mean the school which is in the minority, or is the one which your critic condemns.

With "quantities" you are much safer, and they—no mean advantage in these times of high prices—pay well.

APPENDIX.

APPENDIX.

RELATIVE VALUE OF FRENCH AND BRITISH WEIGHTS, MEASURES, &c.

French.	WEIGHTS. CONTAINING	***British.***
Decamillier or Bar	10,000,000 grammes	= 22050 pounds avoirdupois.
Millier	1,000,000 „	= 2205 „ „
Quintal	100,000 „	= 220·50 „ „
Myriagramme	10,000 „	= 22·050 „ „
Kilogramme	1,000 „	= 2·2050 „ „
Hectogramme	100 „	= 1543·4 grains „
Decagramme	10 „	= 154·34 „ „
Gramme		= 15·434 „ „
Decigramme or $\frac{1}{10}$ of a gramme		= 1·543 „ „
Centigramme or $\frac{1}{100}$ „		= 0·154 „ „
Milligramme or $\frac{1}{1000}$ „		= 0·015 „ „

French.	LENGTHS. CONTAINING	***British.***
Myriametre or	10,000 metres	= 10936 yards.
Kilometre or	1,000 „	= 1093·6 „
Hectometre or	100 „	= 109·36 „
Decametre or	10 „	= 10·936 „
Metre		= 39·371 inches.
Decimetre or	$\frac{1}{10}$ of metre	= 3·9371 „
Centimetre or	$\frac{1}{100}$ of metre	= 0·3937 „
Millimetre or	$\frac{1}{1000}$ of metre	= 0·0393 „

French.	SUPERFICIES.	***British.***
Hectare or	100 ares	= 11960 yards.
Decare or	10 ares	= 1196·0 superficial yards.
Are		= 119·60 „
Deciare or	$\frac{1}{10}$ of are	= 11·960 „
Centiare or	$\frac{1}{100}$ of are	= 10·764 superficial feet.
Milliaré or	$\frac{1}{1000}$ of are	= 1·076 „

French.	CUBIC.	***British.***
Myrialitre	10,000 litres	= 353·15 cubical feet.
Kilolitre	1,000 „	= 35·315 „
Hectolitre	100 „	= 3·531 „
Decalitre	10 „	.. 0·353 „
Litre		.. 0·035 „

Decilitre, $\frac{1}{10}$ of litre.
Centilitre, $\frac{1}{100}$ of litre.
Millilitre, $\frac{1}{1000}$ of litre.

RELATIVE VALUE OF BRITISH AND FOREIGN SQUARE AND CUBIC MEASURES.

(*English Square Foot* 144 *inches, ditto Cube Foot* 1728 *inches.*)

Country or Place.	Sq. Foot in English Sq. Inches.	Cubic Foot in English Cubic Inches.	Country or Place.	Sq. Foot in English Sq. Inches.	Cubic Foot in English Cubic Inches.
Amsterdam	124·255	1385·070	Lisbon ..	167·547	2168·728
Berlin ..	148·693	1813·162	Prussia ..	152·670	1886·390
Berne ..	133·287	1538·798	Rhineland	152·670	1886·390
Dantzic ..	127·690	1442·897	Riga ..	116·424	1256·215
Dresden ..	124·099	1382·463	Rome ..	137·358	1609·835
France ..	163·558	2091·743	Spain ..	123·832	1378·002
Geneva ..	369·024	7088·951	Sweden ..	136·515	1595·041
Hanover ..	131·194	1502·696	Venice ..	187·142	2560·102
Leipsig ..	123·432	1371·329	Vienna ..	155·002	1929·774

RELATIVE VALUE OF BRITISH AND FOREIGN ROAD MEASURES.

(*The English Mile being* 1760 *Yards long.*)

Country or Place.	Name of Measure.	English Yards.	No. of each equal to 100 English Miles.
Denmark	Mile..	8244	21·348
Flanders	League	6864	25·641
France	League of 2000 Toises ..	4263	41·285
Germany	Mile, long	10126	17·381
Hamburg	Mile..	8244	21·348
Hanover	Mile..	11559	15·226
Holland	Mile..	8103	21·725
Hungary	Mile..	9113	19·313
Netherlands	Mile, Metrical	1093	161·024
Poland	Mile, Long	8103	21·725
Portugal	League	6760	26·035
Prussia	Mile..	8237	21·367
Russia	Verst	1067	150·814
Spain	League, Common	7416	23·732
Sweden	Mile..	11700	15·042
Switzerland	Mile..	9153	19·228
ey	Berri	1826	96·385

To find the Area of a Circle.—Multiply the square of the diameter by 9 in., 5 parts, or ·7854.

To find the Circumference of a Circle.—Multiply the diameter by 3·1416 or 3⅐.

To find the Solidity of a Sphere.—Multiply the cube of the diameter by ·5236.

To find the Surface of a Spherical Segment or Zone. Multiply the diameter by the height, and then by 3·1416.

To find the Solidity of the above. To three times the square of the radius add the square of its height, and then multiply the sum by the height, and the product by ·5236.

To find the Area of an Ellipse.—Multiply the two diameters together, and then by ·7854 (as for a circle).

To find the Circumference of an Ellipse.—Add the two diameters together, halve them, and multiply by 3·1416.

To find the Deduction for a Groin Void.—Multiply the cube by ·904.

To find the Area of the Segment of a Circle.—Add two-thirds of the chord to the square of versed sine divided by twice the chord, and multiply their sum by the versed sine = the area.

CIRCUMFERENCES OF CIRCLES.

Diam.	Circumf.	Diam.	Circumf.	Diam.	Circumf.	Diam.	Circumf.	Diam.	Circumf.
In., ft., or yds.									
1	3·14	5	15·70	9	28·27	13	40·84	17	53·40
¼	3·93	¼	16·49	¼	29·05	¼	41·62	¼	54·19
½	4·71	½	17·27	½	29·84	½	42·41	½	54·97
¾	5·50	¾	18·06	¾	30·63	¾	43·19	¾	55·76
2	6·28	6	18·84	10	31·41	14	43·98	18	56·54
¼	7·07	¼	19·63	¼	32·20	¼	44·76	¼	57·33
½	7·85	½	20·42	½	32·98	½	45·55	½	58·11
¾	8·64	¾	21·20	¾	33·7	¾	46·33	¾	58·90
3	9·42	7	21·99	11	34·55	15	47·12	19	59·69
¼	10·21	¼	22·77	¼	35·34	¼	47·90	¼	60·47
½	10·99	½	23·56	½	36·12	½	48·69	½	61·26
¾	11·78	¾	24·34	¾	36·91	¾	49·48	¾	62·04
4	12·56	8	25·13	12	37·69	16	50·26	20	62·83
¼	13·35	¼	25·91	¼	38·48	¼	51·05	¼	63·61
½	14·13	½	26·70	½	39·27	½	51·83	½	64·40
¾	14·92	¾	27·48	¾	40·05	¾	52·62	¾	65·18

AREAS OF CIRCLES.

Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.	Diam.	Area.
In., ft., or yds.									
1	0·7854	5	19·64	9	63·62	13	132·73	17	226·98
¼	1·23	¼	21·65	¼	67·20	¼	137·88	¼	233·70
½	1·77	½	23·76	½	70·88	½	143 14	½	240 53
¾	2·40	¾	25·97	¾	74·66	¾	148·49	¾	247·45
2	3·14	6	28·27	10	78·54	14	153·94	18	254·47
¼	3·98	¼	30·68	¼	82·52	¼	159·48	¼	261·58
½	4·90	½	33 18	½	86·59	½	165·13	½	268·80
¾	5·94	¾	35·78	¾	90·76	¾	170·87	¾	276·11
3	7·06	7	38·48	11	95·03	15	176·71	19	283·53
¼	8·29	¼	41·28	¼	99·40	¼	182·65	¼	291·04
½	9·62	½	44·18	½	103·87	½	188·69	½	298·64
¾	11·04	¾	47·17	¾	108·43	¾	194·82	¾	306·35
4	12·56	8	50·26	12	113·09	16	201·06	20	314·16
¼	14·18	¼	53·46	¼	117·86	¼	207·39	¼	322·06
½	15·90	½	56·74	½	122·72	½	213·82	½	330 06
¾	17·72	¾	60·13	¾	127·66	¾	220·35	¾	338·16

GENERAL TABLES.

BRICKLAYER.

1 cubic yard of clay will make about 450 bricks.
Stock bricks measure 8¾ × 4¼ × 2¾.
Paving bricks „ 9 × 4½ × 1¾.
Dutch clinkers „ 6¼ × 3 × 1½.
450 stock bricks weigh 1 ton.
1 rod of brickwork weighs 13 tons.

500 bricks 22 bushels sand, lime, &c. 36 hods, do. 27 feet cubic, do.	= 1 load.

54 feet cubic = 1 double load.

Bricklayers' Hod

Measures 16″ × 9″ × 9″.
Will hold 20 bricks.
„ ½-bushel mortar nearly.

One Rod of Brickwork

= 272 feet super., 1½ brick thick.
= 408 „ 1 „
= 204 „ 2 „
= 163 „ 2½ „
= 136 „ 3 „
= 306 feet cubic.

One Rod of Brickwork contains :—

If laid dry in wells, &c. (about)	4900	Stocks.
„ walls, „	5370	
If laid in mortar, „	4350	

One Superficial Foot of Reduced Brickwork contains :—

„ „ „ „	16 bricks.
„ „ facing	7 „
„ „ gauged arches	10 „

One Yard of Bricknogging on Edge contains :—

„ „ „	30 stocks.
„ „ laid flat	45 „

One Yard of Paving contains :—

Stock bricks laid flat	36
„ on edge	52
Paving bricks laid flat	36
„ on edge	82
Dutch clinkers laid flat	120
„ on edge	140

TILING.

A plain tile is 10½" long, and 6¼" wide.
A pantile 13½" „ 9½" „
1000 tiles = 1 load.
1000 plain tiles weigh 22¼ cwts.
1000 pantiles „ 47 „
A plain tile lath is 1¼" wide, and ¼" thick.
A pantile „ 1½" „ 1" „
12 pantile laths 10 feet long = 1 bundle.
100 plain tile laths 5 feet long } 1 bundle.
125 „ „ 4 „ } 1 bundle.
167 „ „ 3 „ } 1 bundle.
500 feet „ any length } 1 bundle.
30 bundles plain tile laths = 1 load.
Lathwood 6 feet long and 6 feet high = 1 fathom.

One Square of Tiling contains:—
600 plain tiles laid to a 4" gauge.
700 „ „ 3½ „
800 „ „ 3 „
150 pantiles „ 12 „
164 „ „ 11 „
180 „ „ 10 „

One Square of Plain Tiles requires:—
1 bundle laths and nails.
1 peck tile-pins.
3 hods mortar.

One Square Pantiling requires:—
1 bundle laths and nails.
1¼ hundred nails.

One square plain tiles weighs 14½ cwt.
„ pantiles „ 7½ „

SLATER.

1 square of slating = 100 feet superficial.
1200 slates = a thousand.
120 „ = a hundred.

Description.	Size.	Weight per M.
Doubles	13 × 6	15 cwt.
Ladies	15 × 8	1½ tons.
Countesses ..	20 × 10	2 „
Duchesses ..	24 × 12	3 „

The foregoing are sold by the thousand; the following, whi seldom used, by the ton. They vary in size, but are generally abo

Imperials	30 × 24
Rags and Queens ..	36 × 24

To ascertain the number of slates required to cover a given area of roofing, take from the length of a slate the *lap* (that is as much as the third slate covers the first), divide the remainder by two, and multiply the quotient by the width of the slate, and the product will be the number of square inches covered by a single slate. By dividing the total area of the surface required to be covered by this, and that again by 144 (the square inches in a foot), the quotient will give the number required.

CARPENTER.

One Load contains:—

40 cubic feet of unhewn timber.
50 „ squared „
600 superficial feet of 1″ deal.
400 „ „ $1\frac{1}{2}$ „
300 „ „ 2 „
240 „ „ $2\frac{1}{2}$ „
200 „ „ 3 „
170 „ „ $3\frac{1}{2}$ „
150 „ „ 4 „

66 cubic feet of deal
65 „ fir
60 „ elm
51 „ beech
45 „ ash
39 „ oak
34 „ mahogany
} = 1 ton.

Battens are 7 inches wide.
Deals „ 9 „
Planks „ 11 „

Hoop Iron.

410 feet run hoop iron $1\frac{1}{4}$ in. wide, No. 16 Birmingham Wire Gauge .. .. .. } = 1 cwt.
576 feet run hoop iron $1\frac{1}{4}$ in. × $\frac{1}{16}$ in. .. = 1 „
360 „ „ do. $1\frac{1}{2}$ in. × $\frac{1}{16}$ in. .. = 1 „
A bundle of hoop iron $1\frac{1}{2}$ in. × $\frac{1}{16}$ in. contains 180 feet and weighs .. .. } .. = $\frac{1}{2}$ „

TABLE OF THE STANDARDS ADOPTED BY TIMBER MERCHANTS.

STANDARD.				HUNDRED.				
Name of Standard.	Standard.	Superficial area of 1″	Superficial area of 1¼″	Hundred.	Superficial area of 1″	Superficial area of 1¼″	Cubical Contents.	Relative Values.
Christiana	$\overset{\prime}{11}\ \left.\begin{matrix}\overset{\prime\prime}{0}\\9\end{matrix}\right\}\ \overset{\prime\prime}{1\frac{1}{4}}$	$\overset{\prime}{10\frac{5}{16}}$	$\overset{\prime}{8\frac{1}{4}}$	$120/\ \overset{\prime}{11}\ \left.\begin{matrix}\overset{\prime\prime}{0}\\9\end{matrix}\right\}\ \overset{\prime\prime}{1\frac{1}{4}}$ or $60/\ 15\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 1\frac{1}{2}$	$\overset{\prime}{1237\frac{1}{2}}$	$\overset{\prime}{990}$	$\overset{\prime}{103\frac{1}{8}}$	
Drammen	$9\ \left.\begin{matrix}0\\6\frac{1}{2}\end{matrix}\right\}\ 2\frac{1}{2}$	$12\frac{3}{16}$	$9\frac{3}{4}$	$120/\ 9\ \left.\begin{matrix}0\\6\frac{1}{2}\end{matrix}\right\}\ 2\frac{1}{2}$ or $120/\ 13\ \left.\begin{matrix}0\\9\end{matrix}\right\}\ 1\frac{1}{4}$ or $60/\ 18\ \left.\begin{matrix}0\\6\frac{1}{2}\end{matrix}\right\}\ 2\frac{1}{2}$	$1462\frac{1}{2}$	1170	$121\frac{7}{8}$	$1\frac{2}{11}$ of C. Standard.
Petersburg	$12\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 1\frac{1}{2}$	$16\frac{1}{2}$	$\overset{\prime\prime}{1\frac{1}{2}}$ 11	$120/\ 12\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 1\frac{1}{2}$ or $60/\ 12\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 3$	1980	$\overset{\prime\prime}{3}$ 660	165	$1\frac{3}{5}$ of C. Standard.
Quebec	$12\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 2\frac{1}{2}$	$27\frac{1}{2}$	$\overset{\prime\prime}{3}$ $9\frac{1}{6}$	$100/\ 12\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 2\frac{1}{2}$ or $100/\ 10\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 3$ $120/\ 10\ \left.\begin{matrix}0\\11\end{matrix}\right\}\ 3$	2750	$916\frac{2}{3}$	$229\frac{1}{6}$	$2\frac{2}{9}$ of C. Standard.

= A long hundred.

One Square of Flooring **contains:—**

100 superficial feet,

and requires

If laid rough	12¼	12 feet deals.
„ edges shot	12½	
„ wrought and folding	13½	
„ wrought, ploughed, and tongued	14	
If laid rough	16	12 feet battens.
„ edges shot	16½	
„ wrought and folding	17	
„ wrought, ploughed, and tongued	18	

SMITH AND FOUNDER.

Several of the following Tables are taken from the valuable little handbook on the weights of iron, by SAMUEL PENN, published by James Hagger in 1870:—

SHEET IRON.

WEIGHT OF A SUPERFICIAL FOOT AS PER BIRMINGHAM WIRE GAUGE.

(*Penn.*)

No. of Gauge.	lb.	No. of Gauge.	lb.
1	12·55	14	3·23
2	11·25	15	2·97
3	10·45	16	2·62
4	9·55	17	2·19
5	8·66	18	1·92
6	8·34	19	1·7
7	7·5	20	1·41
8	6·64	21	1·32
9	6·29	22	1·15
10	5·5	23	·99
11	4·73	24	·95
12	4·3	25	·84
13	3·64	26	·78

(*Penn.*)

The Weight of One Foot of Flat Iron closely hammered, in Pounds.

Breadth.	Parts of an inch in thickness.						
	¼	⅜	½	⅝	¾	⅞	inch.
inches.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	0·83	1·25	1·66	2·05	2·50	2·91	3·33
1⅛	0·93	1·4	1·87	2·34	2·81	3·28	3·75
1¼	1·04	1·56	2·08	2·60	3·12	3·64	4·16
1⅜	1·14	1·71	2·29	2·86	3·40	4·01	4·58
1½	1·25	1·87	2·52	3·12	3·75	4·37	5·0
1¾	1·45	2·18	2·91	3·64	4·37	5·10	5·83
2	1·66	2·5	3·33	4·16	5·00	5·83	6·66
2¼	1·87	2·81	3·75	4·68	5·62	6·56	7·50
2½	2·08	3·12	4·16	5·20	6·25	7·29	8·33
2¾	2·29	3·43	4·58	5·72	6·87	8·02	9·16
3	2·5	3·75	5·0	6·25	7·50	8·75	10·0
3¼	2·7	4·06	5·41	6·77	8·12	9·47	10·83
3½	2·91	4·37	5·83	7·29	8·75	10·20	11·66
3¾	3·11	4·68	6·25	7·80	9·37	10·93	12·50
4	3·33	5·0	6·66	8·32	10·0	11·66	13·33
4¼	3·53	5·31	7·08	8·85	10·62	12·39	14·16
4½	3·74	5·62	7·5	9·36	11·25	13·12	15·0
4¾	3·95	5·93	7·91	9·88	11·87	13·85	15·83
5	4·16	6·25	8·32	10·04	12·5	14·58	16·66
5¼	4·37	6·55	8·75	10·92	13·12	15·31	17·49
5½	4·58	6·86	9·16	11·45	13·75	16·04	18·32
5¾	4·79	7·18	9·58	11·97	14·37	16·77	19·16
6	5·2	7·5	10·0	12·5	15·0	17·5	20·0

(*Penn.*)

SQUARE AND ROUND IRON, WEIGHT PER FOOT.

Size in inches.	Square.		Diameter in inches.	Round.	
	Wrought.	Cast.		Wrought.	Cast.
	lb.	lb.		lb.	lb.
¼	0·208	0·20	¼	0·163	0·15
⅜	0·468	0·44	⅜	0·368	0·34
½	0·833	0·78	½	0·654	0·61
⅝	1·30	1·22	⅝	1·02	0·95
¾	1·87	1·75	¾	1·47	1·38
⅞	2·55	2·39	⅞	2·00	1·87
1	3·33	3·12	1	2·61	2·45
1⅛	4·21	3·95	1⅛	3·31	3·10
1¼	5·20	4·88	1¼	4·09	3·83
1⅜	6·30	5·90	1⅜	4·94	4·64
1½	7·50	7·03	1½	5·89	5·52
1⅝	8·80	8·25	1⅝	6·91	6·48
1¾	10·20	9·57	1¾	8·01	7·51
1⅞	11·71	10·98	1⅞	9·20	8·62
2	13·33	12·50	2	10·47	9·81
2⅛	15·05	14·11	2⅛	11·82	..
2¼	16·87	..	2¼	13·25	..
2⅜	18·80	..	2⅜	14·76	..
2½	20·80	..	2½	16·36	..
2⅝	22·96	..	2⅝	18·03	..
2¾	25·20	..	2¾	19·79	..
2⅞	27·55	..	2⅞	21·63	..
3	30·00	..	3	23·56	..
3¼	35·20	..	3¼	27·65	..
3½	40·80	..	3½	32·07	..
3¾	46·87	..	3¾	36·81	..
4	53·33	..	4	41·88	..
4¼	60·20	..	4¼	47·28	..
4½	67·50	..	4½	53·01	..
4¾	75·20	..	4¾	59·06	..
5	83·33	..	5	65·45	..

TABLE OF THE WEIGHTS PER FOOT RUN, AND SECTIONAL AREAS OF EQUAL-SIDED ANGLE AND TEE IRONS.

The L and T Irons are taken as Uniformly Thick in each Part.

Thickness of section in inches and parts.	Thickness in parts of an inch.																	
	¼		5/16		⅜		7/16		½		9/16		⅝		11/16		¾	
	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.	lb.	sec. area.
1½	2·31	·69	2·82	·84	3·31	·99	3·77	1·12	4·20	1·26								
1⅝	2·52	·75	3·08	·92	3·62	1·08	4·14	1·20	4·62	1·38								
1¾	2·73	·81	3·35	1·00	3·94	1·18	4·51	1·35	5·04	1·51								
1⅞	2·94	·88	3·61	1·08	4·25	1·27	4·88	1·46	5·46	1·63								
2	3·15	·94	3·88	1·16	4·57	1·37	5·24	1·57	5·88	1·76	6·50	1·94	7·09	2·12	7·65	2·29	8·19	2·45
2¼	3·57	1·06	4·40	1·32	5·20	1·50	5·98	1·76	6·72	2·01	7·44	2·23	8·14	2·44	8·81	2·64	9·45	2·82
2½	3·99	1·19	4·92	1·47	5·83	1·74	6·71	2·00	7·56	2·26	8·39	2·52	9·19	2·75	9·96	2·93	10·71	3·15
2¾	4·41	1·32	5·45	1·63	6·46	1·93	7·45	2·23	8·40	2·51	9·33	2·79	10·24	3·07	11·12	3·33	11·97	3·58
3	4·83	1·44	5·97	1·78	7·09	2·12	8·18	2·44	9·24	2·77	10·28	3·08	11·29	3·38	12·27	3·67	13·23	3·96
3¼	5·25	1·57	6·50	1·94	7·72	2·31	8·92	2·67	10·08	3·02	11·22	3·36	12·34	3·69	13·43	4·02	14·49	4·34
3½	5·67	1·69	7·02	2·10	8·35	2·50	9·65	2·88	10·92	3·28	12·17	3·65	13·39	4·01	14·58	4·36	15·75	4·72
3¾	6·09	1·82	7·55	2·26	8·98	2·69	10·39	3·11	11·76	3·52	13·11	3·92	14·44	4·32	15·74	4·72	17·02	5·11
4	6·51	1·95	8·07	2·41	9·61	2·86	11·12	3·32	12·60	3·77	14·06	4·22	15·49	4·64	16·89	5·06	18·27	5·47
4¼	6·93	2·07	8·60	2·57	10·24	3·07	11·86	3·55	13·44	4·02	15·00	4·49	16·54	4·95	18·05	5·40	19·53	5·82
4½	7·35	2·20	9·12	2·73	10·97	3·25	12·59	3·77	14·28	4·28	15·95	4·78	17·59	5·27	19·20	5·75	20·79	6·22
4¾	7·77	2·33	9·65	2·89	11·50	3·44	13·32	3·98	15·12	4·53	16·89	5·06	18·64	5·58	20·36	6·09	22·05	6·60
5	8·19	2·45	10·17	3·04	12·13	3·63	14·06	4·20	15·96	4·77	17·84	5·34	19·69	5·89	21·51	6·44	23·31	6·98
5¼	8·61	2·58	10·69	3·20	12·76	3·82	14·80	4·43	16·80	5·03	18·78	5·62	20·74	6·21	22·67	6·78	24·57	7·35
5½	9·03	2·70	11·22	3·35	13·39	4·00	15·53	4·65	17·64	5·28	19·73	5·91	21·79	6·52	23·82	7·13	25·83	7·73
5¾	9·45	2·82	11·75	3·52	14·02	4·20	16·27	4·86	18·48	5·53	20·67	6·19	22·84	6·84	24·88	7·48	27·09	8·11
6	9·87	2·92	12·27	3·66	14·65	4·38	17·00	5·09	19·32	5·78	21·62	6·47	23·89	7·15	26·13	7·82	28·36	8·48

The weights are given in pounds and decimal parts; the sectional areas are given in inches and decimal parts.

(*Penn.*)

WEIGHT OF CAST-IRON PIPES, 12 INCHES LONG, FROM ¼" TO 1¼" THICK.

Diam. of bore.	¼	⅜	½	⅝	¾	⅞	1"	1⅛	1¼
1	3·06	5·06	7·36	9·97	12·89	16·11	19·63		
1¼	3·68	5·98	8·59	11·51	14·73	18·25	22·09		
1½	4·29	6·9	9·82	13·04	16·56	20·4	24·54	28·99	33·74
1¾	4·91	7·83	11·05	14·57	18·41	22·55	27·0	31·75	36·76
2	5·53	8·75	12·27	16·11	20·25	24·7	29·45	34·46	39·89
2¼	6·14	9·66	13·5	17·64	22·09	26·84	31·85	37·28	42·95
2½	6·74	10·58	14·72	19·17	23·92	28·93	34·36	40·03	46·02
2¾	7·36	11·5	15·95	20·7	25·71	31·14	36·81	42·8	49·08
3	7·98	12·43	17·18	22·19	27·62	33·29	39·28	45·56	52·16
3½	9·2	14·21	19·64	25·31	31·3	37·58	44·18	51·08	58·29
4	10·44	16·11	22·1	28·38	34·98	41·88	49·09	56·61	64·43
4½	11·66	17·94	24·54	31·44	38·65	46·17	53·99	62·12	70·56
5	12·88	19·78	26·99	34·51	42·33	50·46	58·9	67·94	76·69
5½	14·11	21·63	29·45	37·58	46·02	54·76	63·81	73·17	82·84
6	15·34	23·47	31·91	40·65	49·7	59·06	68·73	78·7	88·75
7	17·79	27·15	36·82	46·79	56·84	67·65	78·53	89·74	101·24
8	20·02	30·83	41·71	52·92	64·42	76·23	88·35	100·78	113·51
9	22·71	34·52	46·64	59·07	71·8	84·84	98·18	111·84	125·8
10	25·6	38·2	51·54	65·2	79·16	93·42	108	122·87	138·06
11	27·62	41·88	56·46	71·33	86·52	102·01	117·81	133·92	150·33
12	30·06	45·55	61·35	77·46	93·6	110·6	127·6	144·96	162·6

CORRUGATED IRON ROOFING.

B. W. Gauge.	Size of Sheets.	Weight per Square.
16	6 ft. × 2 ft. to 8 ft. × 3 ft.	3⅛ cwts.
18	" "	2¼ "
20	" "	1¾ "
22	" "	1½ "
24	" "	1¼ "
26	" "	1 "

Water—

1 gallon weighs about 10 lb.
1 cubic foot contains 6⅛ gallons.

TABLE SHOWING CONTENTS OF CISTERNS OF VARIOUS SIZES.

Contents.	Length.	Breadth.	Depth.
30 gallons.	2 feet 0 in.	1 foot 6 in.	1 foot 8 in.
40 „	2 „ 7 „	1 „ 6 „	1 „ 8 „
50 „	2 „ 7 „	1 „ 7 „	2 „ 0 „
60 „	2 „ 7 „	1 „ 9 „	2 „ 2 „
70 „	2 „ 10 „	1 „ 10 „	2 „ 2 „
80 „	3 „ 0 „	2 „ 0 „	2 „ 2 „
90 „	3 „ 0 „	2 „ 0 „	2 „ 5½ „
100 „	3 „ 0 „	2 „ 2 „	2 „ 6 „
110 „	3 „ 3 „	2 „ 3 „	2 „ 6 „
120 „	3 „ 3 „	2 „ 4 „	2 „ 7 „
130 „	3 „ 4 „	2 „ 4 „	2 „ 9 „
140 „	3 „ 7 „	2 „ 4 „	2 „ 9 „
150 „	3 „ 7 „	2 „ 5 „	2 „ 10 „

PLASTERER.

1 cask Portland or Parian cement contains 4 bushels.
1 cask Roman cement contains 5 bushels.
1 sack Portland cement contains 2 bushels.
1 sack Roman cement contains 3 bushels.
1 bag plaster of Paris contains 14 lb.
1 sack plaster of Paris contains 2 cwt.
1 bag lime contains 2150 cub. inches.

1 bundle laths contains 500 feet run.
Single fir laths are $\frac{3}{16}$" thick.
Lath and half, ¼" thick.
Double laths, ⅜".

1¼ yard lime
2½ yards sand } will cover 100 yards *rendering* only.
15 lb. hair

2¼ yard lime
2¼ yard sand } will cover 100 yards *render and set.*
18 lb. hair

2½ yards lime
3¼ yards sand } will cover 100 yards *render flat and set.*
21 lb. hair

1 bushel cement and 1 bushel sand will cover 4½ yards ½" thick.
1 bundle laths and 400 nails will cover 5 yards nearly.
2 bushels lime will do 100 yards of limewhiting.

PLUMBER.

THICKNESS OF LEAD.

Weight per foot super. in lb.	Thickness in inches.	Weight per foot super. in lb.	Thickness in inches.
4	·068	7	·118
5	·085	8	·135
6	·100	9	·152

WEIGHT OF LEAD PIPES.

	Light.	Middling.	Strong.
½" = 15 feet length	15 lb.	17 lb.	22 lb.
¾ " "	24 "	28 "	32 "
1 " "	36 "	42 "	50 "
1½ " "	48 "	56 "	64 "
2 " "	84 "	96 "	112 "

WEIGHT OF ZINC *per foot super.*

Gauge.	Weight.			Gauge.	Weight.		
	lb.	oz.	drms.		lb.	oz.	drms.
6	—	7	10	13	1	3	9
7	—	8	12	14	1	5	12
8	—	9	13	15	1	7	14
9	—	10	14	16	1	10	1
10	—	13	1	17	1	14	6
11	—	15	4	18	2	2	11
12	1	1	6				

PAINTER.

5 lb. white lead
5 lb. putty
1 quart oil
} will cover 45 yards of first coat.

5 lb. white lead
1 quart oil
} will cover 45 yards each succeeding coat.

GLAZIER.

1 crate of crown glass contains—
12 tables of the best.
15 " seconds.
18 " thirds.
18 " fourths.

Each table measuring from 48 to 54 inches diameter.

PAPERHANGER.

12 yards lineal = 1 *piece* of paper.
1 dozen border = 12 yards.

Paper is usually 20 inches wide.

To find the number of pieces of paper required to cover a room, divide the superficial area to be covered in feet, by 60 (the number of feet superficial in a piece).

French papers vary in length and breadth according to quality, but are generally from 9 to 9½ yards long, and from 18 to 18½ in. wide.

TABLES OF CONSTANTS.

I do not know that I can better conclude a work of this nature than by laying before my readers the annexed "Tables of Constants." I am aware they are very far from perfect, but they are collected from different sources, and I trust will be found of service. In estimating it is often the case that we are at a loss to know the time a certain class of work will take a man to execute. By referring to the Table, we ascertain the number of hours an average skilled artisan may be expected to do it in; but, as different men take different times, varying according to the skill of the workman, it follows that the most carefully computed Tables necessarily suffer in a degree not to be rectified. It is impossible to lay down abstract rules for every item, or indeed every trade, because they vary in nearly every job. I refer particularly to the Plumber, which I have entirely omitted.

The subject of valuing quantities is not the least important with which the surveyor has to do, but it is one that requires a very large amount of experience and knowledge, and one that the student must overcome before he can become competent or qualified as a surveyor.

In the following Tables it will be necessary to multiply the constant by the rate per hour of the workmen (if they are paid at different rates take the average), which will give the price of the labour. To this must be added the cost of the material, and the total will give the estimated prime cost of the work.

EXCAVATOR.

	Labourer.	
Excavation only—at per yard cube :—		
Vegetable earth or loam	·6	hours.
Clay or heavy ground	1·0	„
Gravel or hard ground	1·5	„
Digging, Throwing into Barrows, and Wheeling—50 yards:—		
Earth	1·4	„
Gravel, clay, &c.	1·8	„
Filling in and Ramming about Foundations	·5	„
Clay Puddling—tempering and laying	6·0	„

BRICKLAYER.

Concrete.—Labour, mixing, wheeling, and throwing in from a stage—per yard cube		3·35	„
Concrete.—Mixing, wheeling, and spreading, and levelling in layers—9″ thick, at per yard super		1·50	„
Ditto ditto ditto 12″ thick		1·95	„
Ditto ditto ditto 18″ „		2·80	„
		Bricklayer and Labourer.	
Brickwork	per rod	49·00	hours.
Ditto in walls 1 brick thick		55·00	„
Extra labour to selected facings	per ft. super	·15	„
Axed arches	„	·45	„
Gauged arches	„	1·50	„
Half-brick walls in cement	„	·15	„
Tuck-pointing	per yard super	2·50	„
Bricknogging laid flat	„	·80	„
„ on edge	„	·60	„
Brick paving laid flat in sand		·45	„
„ on edge in sand		·70	„
„ laid flat in mortar		·56	„
„ on edge in mortar		·85	„
Paving bricks laid flat in sand		·45	„
„ on edge in sand		1·05	„
„ laid flat in mortar		·75	„
„ on edge in mortar		1·20	„
4-inch drain pipe laid and jointed in cement, including junctions	per foot run	·12	„
6 „ „ „	„	·18	„
9 „ „ „	„	·25	„
12 „ „ „	„	·35	„
18 „ „ „	„	·50	„
Pantiling laid dry	per square	4·22	„
„ pointed outside	„	6·85	„
„ pointed both sides	„	7·90	„
Plain tiling laid to a 4″ gauge	„	7·40	„
„ „ 3½″ gauge	„	7·60	„
„ „ 3″ gauge	„	7·90	„

MASON.

Labour on Portland or similar stone—per foot super	Mason.
Sawing	1·25 hours.
Plain work in beds and joints	1·40 „
Sunk work „ „	1·75 „
Plain face, rubbed	1·60 „
Plain face, circular	2·40 „
Sunk work, rubbed	2·00 „
Sunk work, circular	2·60 „
Moulded work	2·55 „
Moulded work, circular	3·82 „
Circular work to shafts of columns	3·25 „
Circular circular work	5·00 „

The labour on Bath stone compared with Portland is about as 4 : 7.

Labour, squaring, and laying York or Purbeck paving—per foot super	·20 „
Add—If in courses	·10 „
Labour, taking up, squaring, and relaying old paving—per foot super	·45 „
Add—If in courses	·15 „

SLATER.

Labour laying—	per square	Slater and Labourer.
Doubles	„	1·70 hours.
Ladies	„	1·50 „
Countesses	„	1·40 „
Duchesses	„	1·20 „

CARPENTER AND JOINER.

	Joiner.
Fir in bond timbers (plates, lintels, and wood bricks)—per foot cube	1·25 hours.
„ framed	1·25 „
„ „ in trusses	1·70 „
„ wrought and framed	2·10 „
„ „ framed, and chamfered	2·50 „
„ „ „ and rebated	2·54 „
„ „ „ rebated, and beaded	2·94 „
„ „ „ „ and double-beaded	3·36 „
„ proper door cases	3·80 „
Planing fir—per foot super	·14 „

Centering—per square.	
For plain cylindrical vaults or arches	15·50 „
„ groined arches	35·00 „
„ trimmer arches—per foot super	·60 „

ROUGH BOARDING—*per square.*

Thickness.	Rough.	Edges Shot.	Ploughed and Tongued.
	hours.	hours.	hours.
¾ inch	5·00	6·66	7·50
1 "	5·40	7·10	9·18
1¼ "	5·84	7·50	10·40
1½ "	6·66	8·62	11·67

FLOORING—*at per square.*

Description.	In Deal Widths.				In Batten Widths.	
	1"	1¼"	1½"	2"	1"	1¼"
	hours.	hours.	hours.	hours.	hours.	hours.
Rough, edges shot	7·65	8·40	9·20	12·10	10·60	12·40
Ditto, wrought, laid folding	11·80	12 55	13·40	16·32	15·00	16·66
Ditto, ditto, straight joint	15·00	15·80	17·20	18·40	16·80	18·56
Ditto, ditto, ditto, splayed heading	—	17·60	20·00	24·20	17·92	21·67
Ditto, ditto, ditto, dowelled	—	31·70	35·00	41·50	—	41·67

Add to each of the foregoing if	Deals.	Battens.
Ploughed and tongued headings	2·95	4·30
Ditto, ditto, edges	5·10	7·50
Tongues to edges of boards	8·40	12·50
If less than 5" wide	—	3·35

Battening—per square.

¾" to 1¼" placed 12" from centre to centre ..	5·90	hours.
Add—If plugged to walls	1·70	"

Weather Boarding—per square.

Rough	4·20	"
" splayed edges	6·80	"
Wrought	10·00	"
" and beaded	12·50	"

Gutter Boards and Bearers—per foot super	·76	"
Inch or 1¼ inch	·75	"

DEALS IN THICKNESSES—*per foot super.*

Description.	¾"	1"	1¼"	1½"	2"
Rough	·09	·11	·12	·13	·15
Edges shot	·15	·18	·20	·23	·28
Wrought one side and edges ..	·23	·26	·28	·31	·36
Ditto both sides and edges ..	·29	·32	·34	·37	·43
Ditto one side and framed ..	·45	·50	·52	·56	·62
Ditto both sides and framed ..	·55	·60	·63	·68	·74

Skirtings—per foot super.

Plain skirting	·37	hours.
,, skirting circular	·70	,,
,, raking cut to steps	·70	,,
Torus skirting	·65	,,
,, circular	·90	,,
,, raking cut to steps	·85	,,
Moulded (common) skirting	·75	,,
,, circular	1·05	,,
,, raking cut to steps	·95	,,

Framed Grounds—per foot super.

Common framed grounds	·63	,,
Inch ditto ploughed for plastering	·70	,,
1¼ ditto ,, ,, ...	·76	,,
1½ ditto ,, ,, ...	·83	,,

Framed Partitions—per foot super.

1½" square framed	·65	,,
Moulded one side	·15	,,
,, both sides	·30	,,
2" square framed	·76	,,
2" moulded one side	·18	,,
2" ,, both sides	·36	,,

Sashes and Frames, per foot super.

Deal cased frames, oak sunk sill, deal pulley stiles, &c., complete for 1½" sashes	·70	,,
Ditto, ditto, for 2" sashes	·82	,,
Ditto, ditto, for 2½" sashes	·85	,,
Add—If prepared with wainscot or mahogany pulley stiles and slips	·85	,,
,, If double hung	·13	,,
1½ inch deal ovolo sashes	·49	,,
1½ inch wainscot or mahogany ditto	·70	,,
2 inch deal ditto..	·70	,,
2 inch wainscot or mahogany ditto	·98	,,
Add—If astragal and hollow in deal	·13	,,
,, If astragal and hollow in wainscot or mahogany	·21	,,

Curved heads, twice that of straight.
Circular on plan, ditto.

nch Casements, per foot super.

1½ inch deal ovolo	·70	hours.
2 and 2½ inch ditto	·80	„
1½ inch wainscot or mahogany	·95	„
2 and 2½ inch ditto	1·15	„
dd—To deal casements if with marginal lights	·16	„
„ To mahogany ditto ditto	·28	„

ndow Linings, per foot super.

Inch deal two-panel square framed back linings	1·00	„
„ bead-butt or moulded	1·12	„
„ bead flush or quirk moulded	1·20	„
dd—For each panel above two, if square	·20	„
„ For each panel if moulded	·26	„
„ If splayed linings	·06	„

ndow Backs, Elbows, and Soffits, per foot super.

Inch deal, plain keyed, or two panel square backs	·85	„
Ditto two panel square backs, elbows and soffits	·98	„
dd—For each panel above three	·10	„
„ If bead-butt or moulded	·12	„
„ If bead flush or quirk moulded	·20	„

xings to Windows, per foot super.

Deal framed rebated and beaded boxings	1·00	„
Splayed ditto ditto	1·20	„

utters, per foot super.

¾ inch deal clamped flaps in one height	1·20	„
Inch ditto, two panel square framed in one height	1·25	„
d—For every panel above two—		
If square framed	·20	„
If bead-butt	·20	„
If bead flush	·25	„
If moulded	·25	„
For every extra height	·10	„

ors, per foot super.

1½ inch deal ledged door, rough edges shot	·65	„
dd—If ploughed and tongued	·12	„
„ „ and beaded	·20	„
„ If wrought one side	·12	„
„ „ both sides	·24	„
„ If braced	·26	„
„ If hung folding	·20	„
Two-panel square framed	·70	„
dd—For every additional two panels—		
If square framed, 1½″ deal	·19	„
„ „ 2″ deal	·21	„
„ „ 2½″ deal	·27	„
„ If bead-butt and square, 1½″	·20	„
„ „ 2″	·24	„
„ „ 2½″	·26	„

Add—If bead flush and square, 1½″	·26	hours.
" " 2″	·26	"
" " 2½″	·42	"
" If moulded, 1½″	·20	"
" 2″	·24	"
" 2½″	·26	"
" If double margins	·25	"
" If hung folding	·15	"
Door Linings, per foot super.		
Plain, single rebated	·55	"
Ditto, ditto, and beaded	·63	"
Ditto, double rebated	·70	"
Ditto, ditto, and double beaded	·75	"
Square framed jambs, each in two panels, and soffit	1·00	"
Add—If bead-butt	·13	"
" If bead flush	·26	"
" If raised panel and moulded	·42	"
" For every extra panel if square	·20	"
" Ditto flush or moulded	·26	"
" If double rebated	·20	"
" If double beaded	·13	"
Staircases, per foot super.	Joiner.	
Treads and risers and fir carriages	·70	hours.
Ditto, moulded nosings and close strings	·98	"
Ditto, ditto, mitred and returned	1·25	"
Add—If winders circular at one end	·40	"
" Ditto, two ends	·80	"
" Ditto, geometrical, with wrought and blocked carriages	·56	"
" Ditto, feather-tongued joints	·21	"
Quarter curtail, glued upright	6·66	"
Ditto, blocked and veneered	11·66	"
Proper curtail step and riser	33·34	"
Returned moulded nosing	2·50	"
Ditto, circular	4·17	"
Plain cut bracket	2·50	"
Plain circular	4·17	"
Housing to step and riser	·98	"
" to winders	1·25	"
" to moulded nosings	1·67	"
" to moulded circular ends	4·59	"
Wall Strings—per foot super.		
Plain and plugging	·80	"
Moulded	1·00	"
Outer Strings—per foot super.		
1½ deal plain	·84	"
" sunk	·98	"
" moulded	1·12	"
" cut for steps and risers	1·27	"
" mitred to risers	1·40	"

If ramped, once and a half of straight.

If wreathed, four times of straight.

drails—per foot run.		
Plain 3″ × 3″		·60 hours.
Moulded	from	·85 „
Add for ramps	„	·55 „
„ wreaths	„	12·00 „
Labour on mahogany handrails = twice that of deal.		
Balusters—per foot run.		
1¼″ × 1¼″		·08 „
„ dovetailed		·06 „
Dovetails in steps for balusters—each		1·70 „
Iron balusters—fixing	„	·70 „
dos—per foot super.		
Proper dado, with dovetailed keys, joints secured with slips, &c. &c.		·70 „
dd—If raking, scribed to steps		·19 „
If to moulded nosings		·20 „
If base grooved into floor		·09 „
If circular on plan, twice the straight.		
sters and Columns—per foot super.		
1¼″ deal plain pilasters, glued and blocked		1·12 „
„ diminished shaft		1·53 „
1¼ „ „ columns, glued and blocked		4·00 „
dd—If arris or fluting to pilasters—1″ wide		·20 „
„ „ „ 2″ „		·25 „
„ „ „ 3″ „		·40 „
If to columns 1″ „		·25 „
„ 2″ „		·35 „
„ 3″ „		·50 „

PLASTERER.

	Plasterer, Labourer and boy
Rendering—per yard super.	·19 hours.
„ curved	·25 „
„ and setting	·32 „
„ „ curved	·38 „
„ floating and setting	·55 „
„ „ „ curved	·62 „
Lathing	·19 „
„ curved	·28 „
Rendering with cement and sand	·85 „
„ „ „ „ curved	1·10 „
Rough casting with lime and gravel	·16 „
„ „ „ „ curved	·32 „
Mouldings and cornices, in plaster—per foot super	·42 „
Limewhiting, colouring, ditto—per yard super	·05 „

PAINTER.

Painting in common colours.

First coat, including knotting, stopping, &c.—at *per yard super*	·27 hours.
Second and each succeeding coat	·14 „

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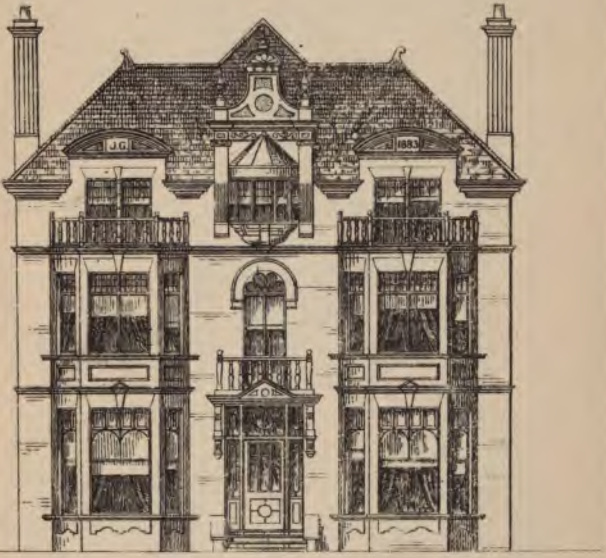

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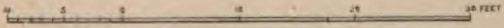

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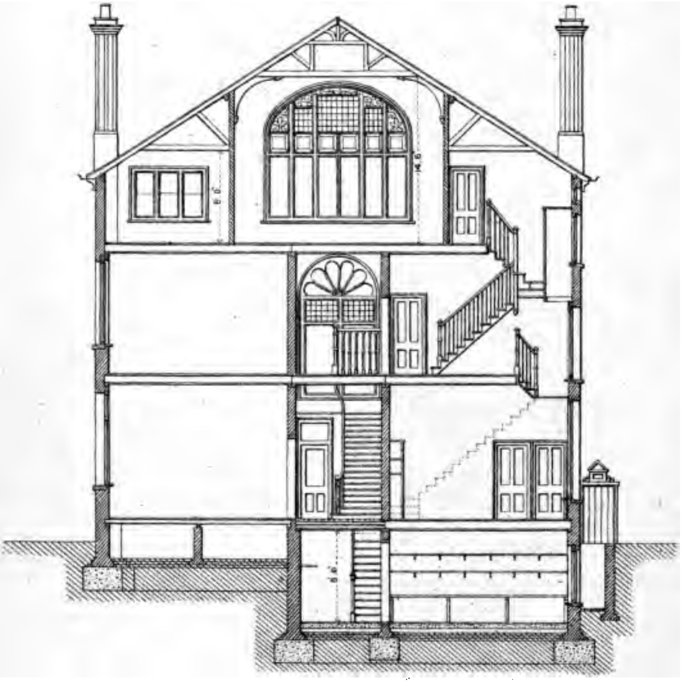

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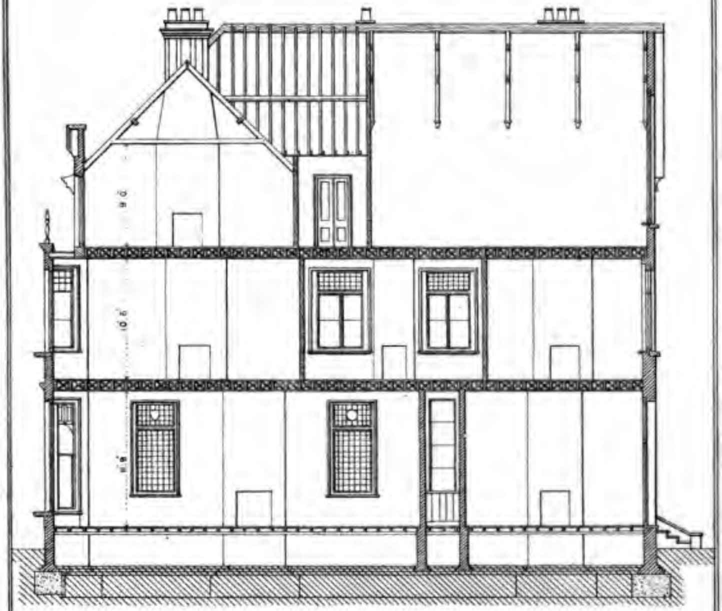

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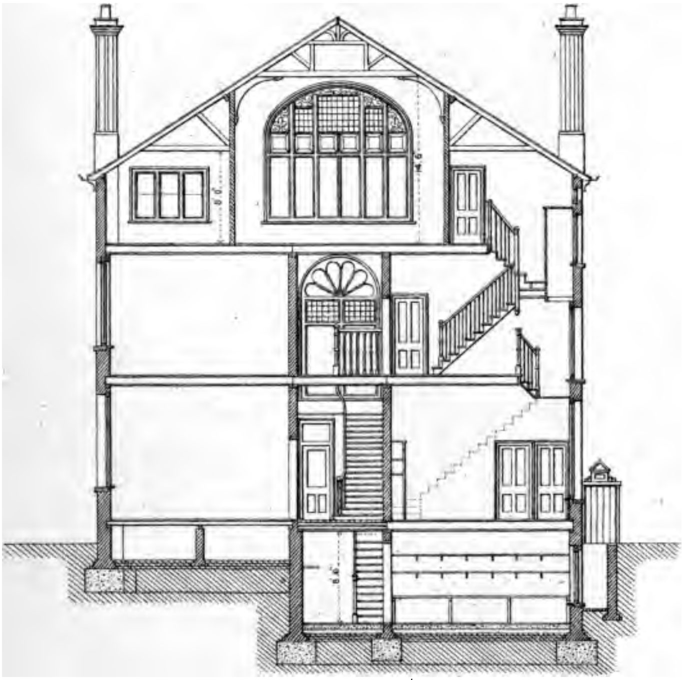

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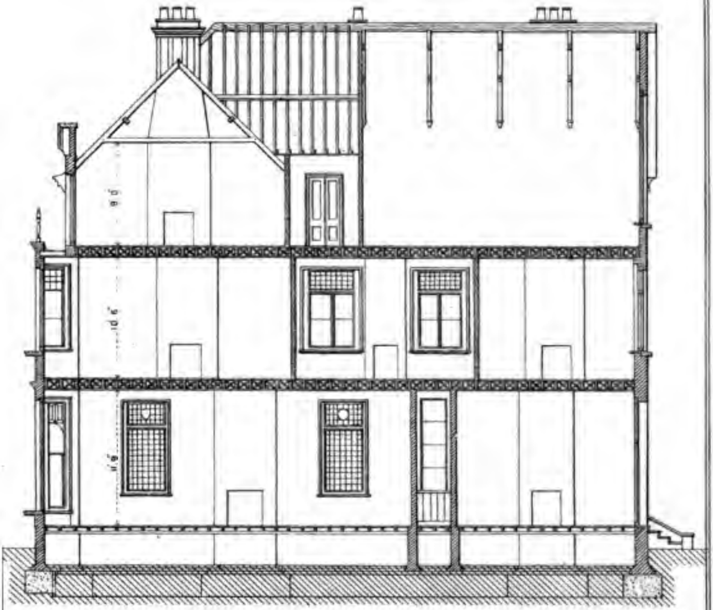

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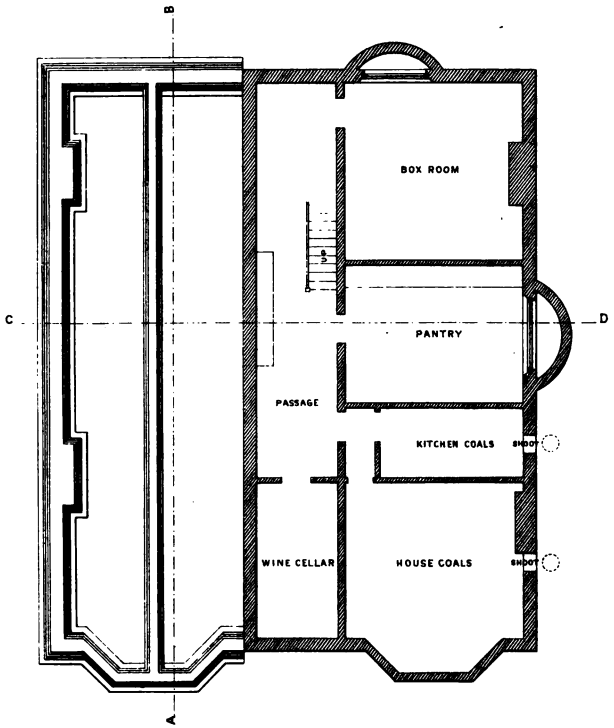

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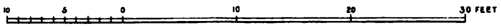

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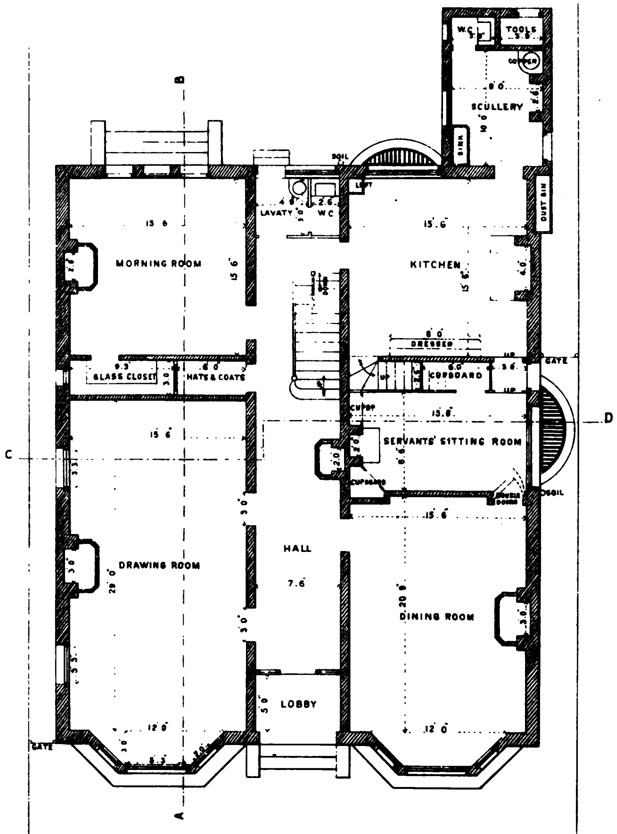

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